NAVAIR 16-45-111

RA-22B VHF Receiver

Overhaul Manual
I.B.1022B-1

Coverage Defined on Title Page

Bendix Avionics Division

Overhaul Manual

RA-22B
VHF Receiver

Part Numbers
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-0502
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-2205
-2206

Manual Number
I.B.1022B-1

Bendix Avionics Division

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NOTE

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To: Holders of RA-22B VHF Receiver Overhaul Manual, I. B. 1022B-1.

REVISION NO. 6

to

OVERHAUL MANUAL I. B. 1022B-1

covering

RA-22B VHF RECEIVER

Date of Original Publication	Oct/62
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Date of Revision No. 6	Nov/70

INSTRUCTIONS:

1. Replace Revision No. 5 Instructions Page with this page.
2. Replace the pages listed under "REMOVE PAGES" with those listed under "INSERT PAGES".

REMOVE PAGES	INSERT PAGES
Rev. No. 5 Highlights	Rev. No. 6 Highlights
2-9/2-10	2-9/2-10

3. Complete applicable columns on the Record of Revisions.

LIST OF EFFECTIVE PAGES

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Revision Highlights/Record of Revisions

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REVISION NO. 6

Nov/70

REVISION HIGHLIGHTS

Pages that have been revised are listed below together with the highlights of that revision.

PAGE NUMBER	DESCRIPTION OF CHANGE
Revision Instructions	Updated for Revision No. 6.
List of Effective Pages	Updated for Revision No. 6.
Revision Highlights	Updated for Revision No. 6.
2-9	Corrected coding chart for frequencies of 136 to 150 mcs.
2-10	Corrected the first sentence of the third paragraph.

RECORD OF REVISIONS

RA-22B VHF Receiver I. B. 1022B-1 NAVAIR 16-45-111	LOCATION
ASSIGNED TO (JOB TITLE)	

REV. NO.	REVISION DATE	INSERTION DATE	BY	REV. NO.	REVISION DATE	INSERTION DATE	BY
1	Nov/62						
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3	Oct/65						
4	Jun/67						
5	Nov/69						
6	Nov/70						

PURPOSE OF MANUAL

This manual provides the information required for the maintenance of the Bendix Type RA-22B VHF Receiver. Installation information for the RA-22B Receiver is contained in I. B. 1022.

The following table lists the Bendix "22 Series" equipment and accessories which have been assigned an AN nomenclature.

BENDIX TYPE NO.	BENDIX PART NO.	AN NOMENCLATURE	TITLE
* RA-22B	2087698-0502	R-1185A/ARC-101	Receiver, Radio
TA-22B	2086758-2	T-907A/ARC-101	Transmiter, Radio
NVA-22A	2086412-1	CV-2059/ARN-87(v)	Converter, Navigation Set
* 4RAX-21/22	2065051-0501	MK-904/ARC	Mod. Kit, Electronic Equipment
CNA-22YSV-1A	2067084-0001	C-6842/ARN-87(v)	Control, Radio Set
CNA-22YSV-1AG	2067084-0003	C6844/ARN-87(v)	Control, Radio Set
CNA-22YSV-1B	2067084-0002	C6843/ARN-87(v)	Control, Radio Set
CNA-22YSV-1BG	2067084-0004	C6845/ARN-87(v)	Control, Radio Set
CNA-22YCS	2087327-17	C4616/ARC-101	Control, Radio Set
* PSA-21A	N2085564-1	PP-2688/ARC-84	Power Supply
* PSA-21B-1	N2086021-1	PP-2448/ARC-84	Power Supply
PSA-21C	N2085527-1	PP-2687/ARC-84	Power Supply
PSA-21D1	N2086220-1	PP-2449/ARC-84	Power Supply
MTA-21A	R240635-3	MT-3593/ARN-87(v)	Mounting
MTA-21CG	2065109-0501	MT-3595/ARN-87(v)	Mounting
MTA-21D	R2085474-1	MT-2248/ARC-84	Mounting
MTA-21DG	2065110-0501	MT-3597/ARC-101	Mounting
MTA-21E	R240635-5	MT-3594/ARN-87(v)	Mounting
MTA-21EG	2067484-0001	MT-3596/ARN-87(v)	Mounting

*indicates unit is included in this manual.

SERVICE BULLETINS

The following list of service bulletins apply to the equipment covered in this manual. Copies of these bulletins are available upon request to:-

Bendix Avionics Division, Dept. 370
2100 N.W. 62nd Street
Fort Lauderdale, Florida 33310

SERVICE BULLETIN NUMBER	DATE OF ISSUE	EQUIPMENT TYPE	PURPOSE OF BULLETIN
M-472	10-1-65	RA-22( )	Replacement of Q101, type SYL-1603 or type 2N144/13 with transistor type 2N657 and socket.
M-513	8-8-66	RA-22B	Disablement of super squelch when tuned to navigation channels.

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DESCRIPTION OF EQUIPMENT

RA-22B VHF RECEIVER

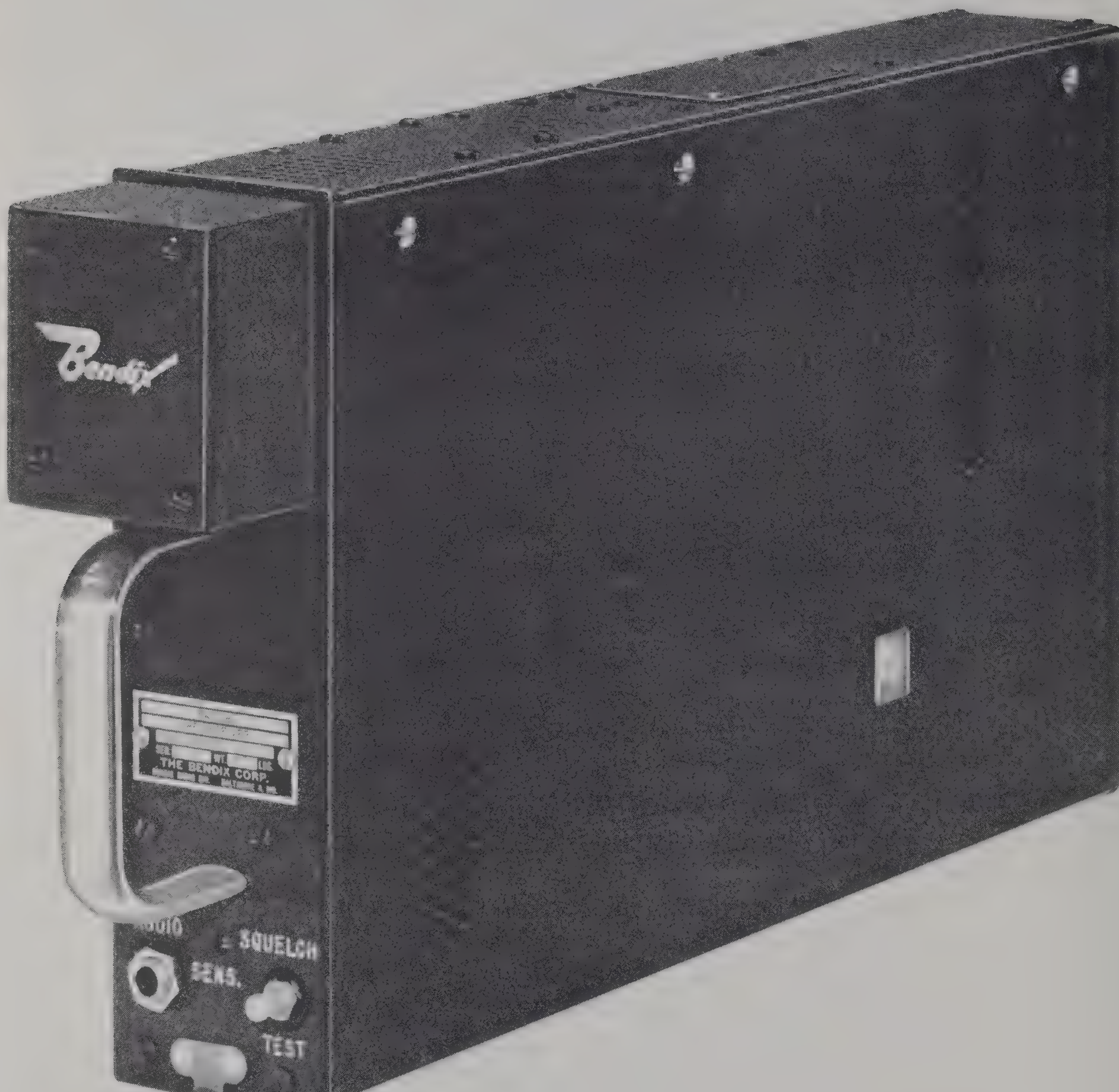

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Figure 1-1. RA-22B VHF Receiver

SECTION I. DESCRIPTION OF EQUIPMENT

1-1. INTRODUCTION

The Bendix Type RA-22B VHF Receiver (figure 1-1) is a remotely operated lightweight airborne equipment,which provides communications and navigation reception in the VHF frequency range. The equipment is designed to operate in conjunction with the Bendix Type TA-22B VHF Transmitter and/or the Bendix Type NVA-22B Navigation Unit to comprise a communications, communications and navigations, or navigation system. The equipment may also be used in conjunction with other Bendix VHF transmitters and navigation units such as the Type TA-21, TA-22, NVA-21, NVA-22, and MNA-21.

1-2. PURPOSE OF EQUIPMENT

The RA-22B provides reception of VHF signals on 880 crystal-controlled communications, VOR, and ILS localizer channels, spaced 50 kilocycles apart, over the 108.00- to 151.95-megacycle range. Channel selection is accomplished by electric control signals from a remote control panel external to the equipment; Bendix Type CNA-22( ) Control Panels have been designed for this purpose. Two separate audio outputs are provided; one with a restricted bandwidth for voice communications, and the other,essentially flat from 30 cps to 10 kc, for VOR, ILS localizer, and ATCSS signals. The phase shift through the receiver at 30 cps is limited to 0.6 ±0.2 degree. A carrier-operated squelch circuit is incorporated into the equipment to mute the communications audio output until the carrier rises above a predetermined level. This level is set by the SENS screwdriver adjustment on the front panel of the RA-22B (figure 1-2). The squelch level may also be remotely controlled. A SQUELCH TEST pushbutton on the front panel permits the squelch circuit to be disabled for test purposes. The squelch is automatically disabled when the RA-22B is tuned to a VOR or localizer channel. During transmission a +27.5-volt receiver disable signal is supplied by the associated transmitter unit to operate the squelch circuit. The RA-22B provides a nominal voice output of 100 milliwatts across a 500-ohm load. Because of the low output impedance, the output level in a headset will remain constant whether other headsets are added or removed. A front panel AUDIO jack is provided for monitoring the voice output at the unit.

Whenever the remote control panel selects a communications channel (normally 118.00 to 151.95 megacycles), the frequency control circuits in the RA-22B provide a +27.5-volt output. In a communications/navigation system, this voltage is used to disable the navigation unit and to switch the receiver input from the horizontally polarized antenna, which is used for navigation, to the vertically polarized antenna, which is used for communications. This changeover normally occurs at 118.00 megacycles. When the RA-22B is being used in an area where the communications frequency range extends down to 116.00 megacycles, the application of a communications/navigation transfer switching input changes the frequency at which the RA-22B switches between the communications and navigation modes to 116.00 megacycles.

Whenever the remote control panel selects an ILS localizer channel (every odd one-tenth megacycle from 108.000 to 111.900 megacycles), the frequency control circuits in the RA-22B provide a +27.5-volt output which is used to activate the associated glide slope receiver and connect the navigation unit

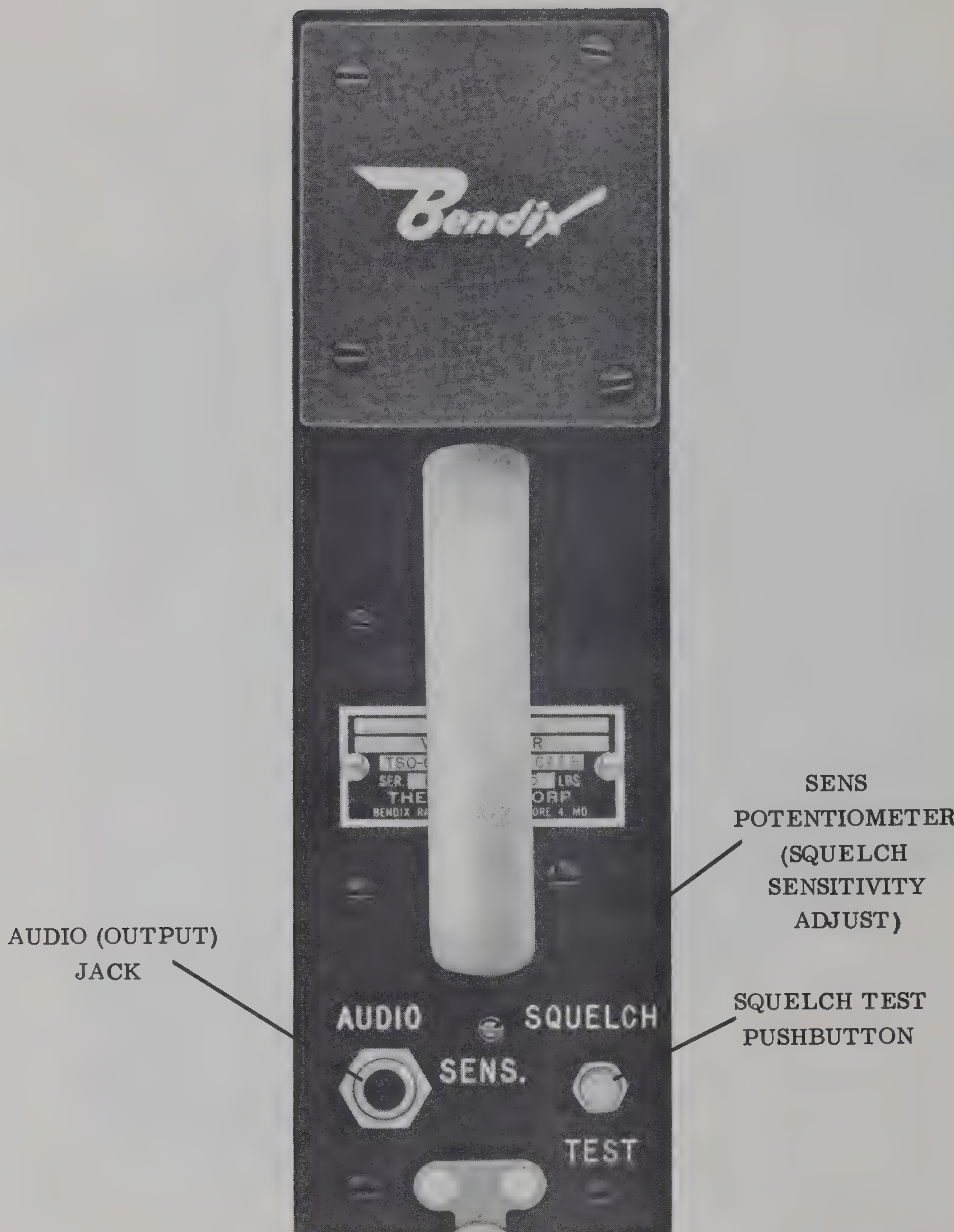

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Figure 1-2. RA-22B VHF Receiver, Front Panel

for ILS operation. The RA-22B requires a +27.5-volt power input to supply the switching and transistor circuits used in the equipment. In addition, the RA-22B requires a separate power supply to provide power for its vacuum tube circuits. This power supply is a separately packaged unit which is normally mounted inside the RA-22B. Either an a-c power supply (PSA-21A Power Supply) operating from a 115-volt 300- to 1000-cps source, or a d-c power supply (PSA-21B, PSA-21B-1, or PSA-21B-2 Power Supplies) operating from the 27.5-volt d-c source, may be used with the RA-22B. In either case, the power supply provides +130 volts for the tube B+ source. In addition, the a-c power supply provides 6.3 volts ac for the tube filaments connected in parallel. The d-c power supply connects a d-c voltage from the RA-22B to the tube filaments in a series-parallel combination which puts 6.3 volts dc across each tube filament.

1-3. DESCRIPTION

A. RA-22B VHF RECEIVER

The RA-22B is housed in a short 1/4 ATR package with a front applique. All connections are made through one connector in the rear. An additional AUDIO jack is provided on the front panel of the equipment to permit monitoring of the audio output. The circuits of the RA-22B are readily accessible by removing the right and left cover plates (figure 1-3). This figure shows the RA-22B five major assemblies: the r-f assembly, the i-f and audio assembly, the 2-mc stepping switch, the 0.1-mc stepping switch, and the power supply. The r-f assembly contains five vacuum tubes which include the r-f amplifier, first i-f amplifier, local oscillator, and mixer stages to convert the input vhf signals to an i-f frequency of 3.725 or 3.775 megacycles. The i-f and audio assembly is completely transistorized, using 24 transistors. This assembly contains local oscillator and mixer stages to convert the input signals to a 460-kc intermediate frequency. The signals are then filtered by a 460-kc filter and amplified by i-f amplifier stages. The i-f and audio assembly also contains the detector and audio amplifier stages required to produce the audio output. Frequency selection is accomplished by the 2-megacycle and 0.1-megacycle solenoid stepping switches. These switches are electrically driven in response to command signals from the remote control panel. The stepping switches select crystals and tuning elements to tune the RA-22B circuits to the correct channel. The 2-megacycle and 0.1-megacycle selections are displayed by corresponding dials at the top and right side of the equipment. A communications/navigation transfer relay mounted in the front applique transfers the changeover between navigation and communications modes from the normal 118.00 megacycles down to 116.00 megacycles.

B. PSA-21A POWER SUPPLY

This a-c power supply (figure 1-4) is designed to operate from a 115-volt, 300- to 1000-cps source. A silicon diode, connected as a half-wave rectifier provides a B+ supply of +130 volts. A filament transformer provides 6.3 volts ac.

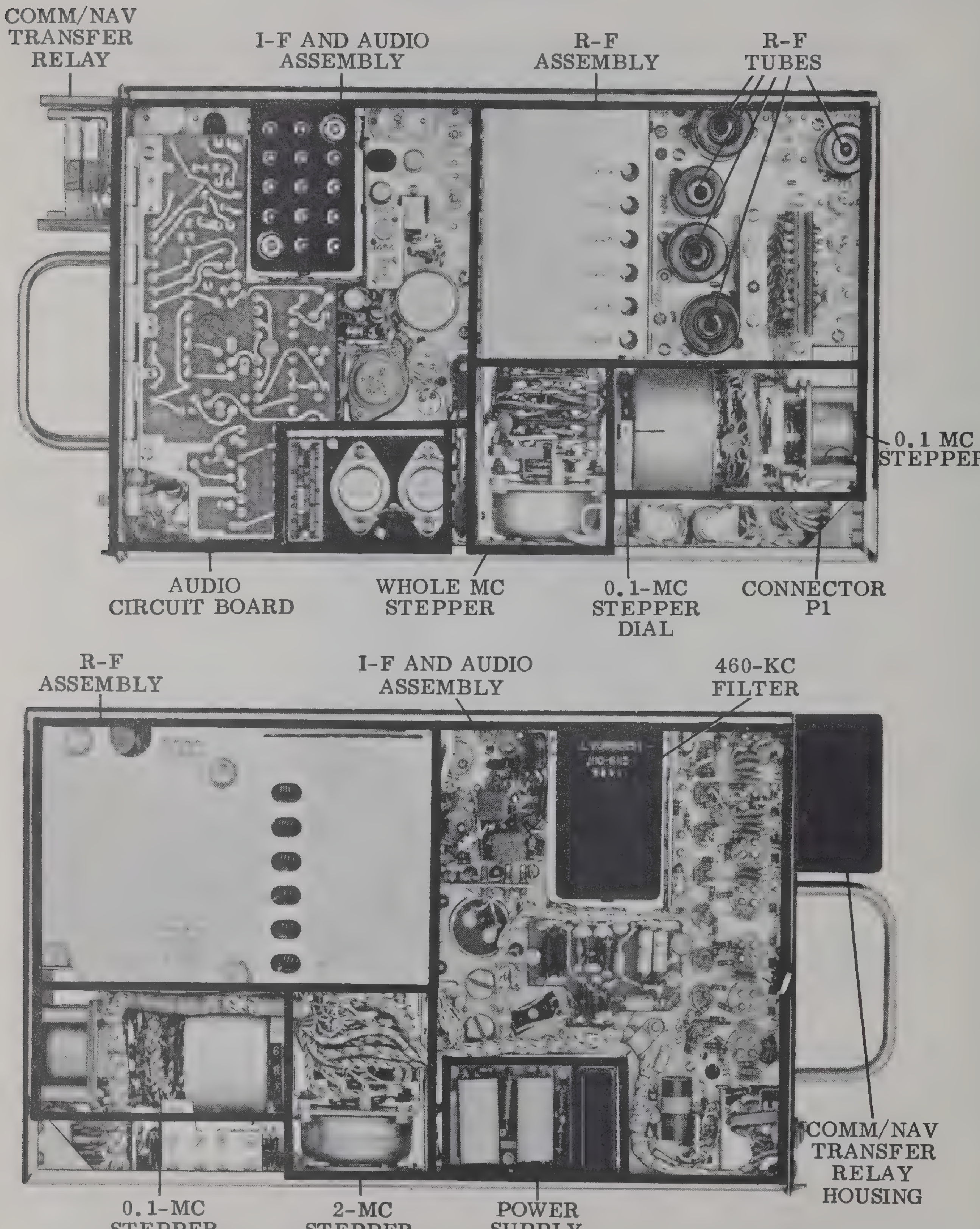

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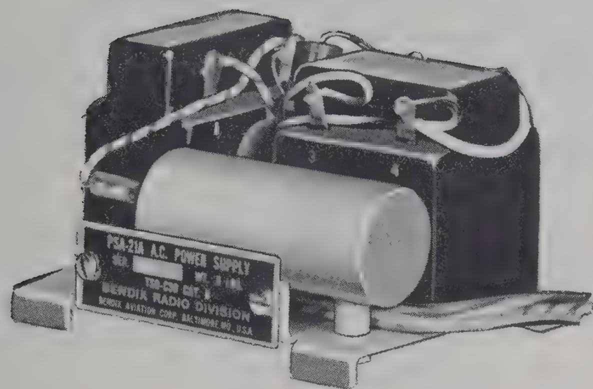
Figure 1-3. RA-22B VHF Receiver, Details of Construction



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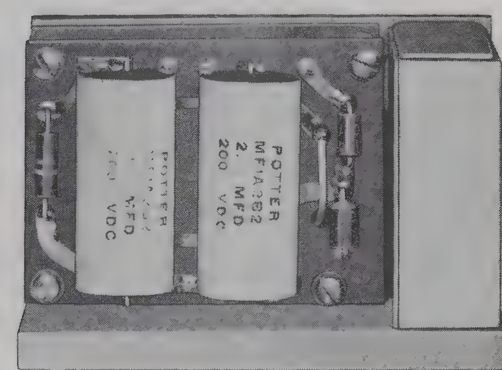
PSA-21A



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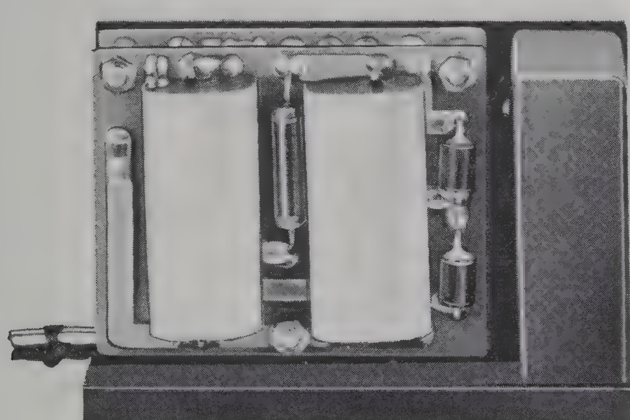
PSA-21B



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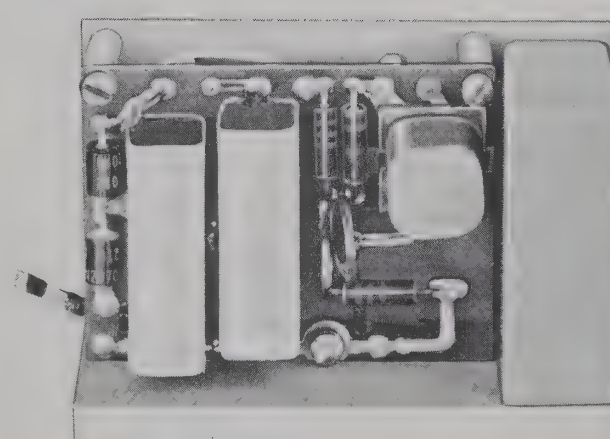
PSA-21B-1



PSA-21B-2

Figure 1-4. Power Supplies

C. PSA-21B, PSA-21B-1, AND PSA-21B-2 POWER SUPPLIES

These d-c power supplies (figure 1-4) use two transistors in a free-running multivibrator circuit powered by regulated +20 volts dc from the RA-22B. The free-running multivibrator operates at a nominal frequency of 2050 cps. This circuit includes a saturable core power transformer which applies a stepped-up voltage to a full-wave rectifier circuit containing two silicon diodes. The plug connecting the d-c power supply to the RA-22B contains jumpers which arrange the RA-22B filament circuits in a series-parallel configuration so that +6.3 volts dc appears across each filament.

1-4. EQUIPMENT AVAILABLE

The accessory equipment available for use with the RA-22B is listed below.

TA-22B VHF Transmitter
NVA-22A Navigation Unit
CNA-22( ) Control Unit
MTA-21D Mounting Base

PSA-21A Power Supply
PSA-21B Power Supply
PSA-21B-1 Power Supply
PSA-21B-2 Power Supply

1-5. SUMMARY OF TYPICAL CHARACTERISTICS

A summary of typical characteristics for the RA-22B is provided in table 1-1.

TABLE 1-1.

RA-22B VHF RECEIVER, SUMMARY OF TYPICAL CHARACTERISTICS

FORM FACTOR		1/4 ATR (short) with front applique
WEIGHT		9.0 lb with power supply
FREQUENCY RANGE		108.00 through 151.95 mc
NUMBER OF CHANNELS		880
CHANNEL SPACING		50 kc
ANTENNA INPUT IMPEDANCE		52 ohms, VSWR not exceeding 2.5:1
HEADPHONE AUDIO OUTPUT	NAV CHANNELS	100 mw into 500 ohms from 30 per cent modulation at 1000 cps
	COMM CHANNELS	100 mw into 500 ohms from 90 per cent modulation at 1000 cps
NAV AND ATCSS OUTPUT		0.5V rms into 1000 ohms, within 2 db from 30 to 10,000 cps
OPERATING TEMPERATURE RANGE		-40°C to +55°C (with 30 minutes operation at +70°C)
STORAGE TEMPERATURE		-65°C
HUMIDITY RANGE		Up to 95 per cent relative humidity
ALTITUDE		Up to 55,000 feet

TABLE 1-1. (Con't)

RA-22B VHF RECEIVER, SUMMARY OF TYPICAL CHARACTERISTICS

DUTY CYCLE		Continuous
CHANNELING TIME		4 seconds maximum
FREQUENCY STABILITY		The resonant frequency will not deviate from the selected frequency more than 0.005 per cent when the ambient temperature is varied from +10°C to +70°C or 0.007 per cent from -40°C to +70°C.
SENSITIVITY		The signal-to-noise ratio is 6 db or better with 3-μv input, 30 per cent modulation, 1000 cps (through 6 db pad)
SELECTIVITY		The bandwidth corresponding to off resonance attenuation is as follows: Attenuation — Bandwidth 6 db — 40 kc min 60 db — 72 kc max
SPURIOUS AND IMAGE REJECTION		At least 80 db down (except 70 db down from 108 to 152 mc)
AUDIO RESPONSE		Will not vary more than 6 db from 300 to 2500 cps. Response above 3000 cps is at least 30 db below the response at 1000 cps.
HARMONIC DISTORTION	NAV CHANNELS	10 per cent max at 30 per cent modulation, 1000 cps, 100 mw output level
	COMM CHANNELS	20 per cent max at 90 per cent modulation, 1000 cps, 100 mw output level
SQUELCH RANGE		Mutes receiver output until application of any preset input from 2 to 25 μv.
INTERMEDIATE FREQUENCIES		1st - 15-17 mc 2nd - 3.75 mc 3rd - 460 kc
CROSS MODULATION		A 30 per cent modulated undesired signal at a level 60 db above the desired signal, and removed 100 kc from the selected frequency will not produce an output greater than 10 db below the rated output.
AUTOMATIC VOLUME CONTROL		Output will not vary more than 1 db with inputs from 10 to 50,000 microvolts.
TUBE COMPLEMENT		Refer to Figure 6-1a for reference designation and type number.
TRANSISTOR COMPLEMENT		Refer to Figure 6-1a for reference designation and type number.
DIODE COMPLEMENT		Refer to Figure 6-1a for reference designation and type number.
VIBRATION		10 to 55 cps — 0.06 inch total excursion per RTCA Paper 100-54/DO-60

TABLE 1-1. (Con't)

RA-22B VHF RECEIVER, SUMMARY OF TYPICAL CHARACTERISTICS

SHOCK		15G operate -- 30G impact per RTCA Paper 100-54/DO-60
POWER REQUIREMENTS	A-C SUPPLY	Receiving - 115V ac (300-1000 cycles), 0.17 amp, power factor .85 27.5V dc, 0.18 amp Channelling (Peak) 27.5V dc, 5.4 amp
	D-C SUPPLY	Receiving 27.5V dc, 0.9 amp Channelling (Peak) 27.5V dc, 6.0 amp
CERTIFICATION		TSO-C36a, C38a, C40a, Category B

SECTION II. CIRCUIT DESCRIPTION

2-1. BLOCK DIAGRAM DISCUSSION

A. FREQUENCY SELECTION

The RA-22B can be tuned to any one of 880 adjacent channels spaced at 50-kilocycle intervals from 108.00 to 151.95 megacycles. Frequency selection is made at an external control panel by selecting one of the 44 whole megacycle bands in this frequency range and then selecting one of the 20 channels within the whole megacycle band. The whole megacycle selection and fractional megacycle selection are supplied to the RA-22B in the form of electrical control signals. These control signals operate solenoid stepping switches in the RA-22B to switch to the selected channel. The whole megacycle selection is coded by two sets of control signals: one set to select the desired 2-megacycle band, and the other to select the first or second (even or odd) whole megacycle in the selected band. The fractional megacycle selection is also coded by two sets of control signals, one set to select the desired 0.1-megacycle (100-kilocycle) band and the other to select the first or second (even or odd) 50-kilocycle channel in the selected 0.1-megacycle band.

In the RA-22B, frequency selection is made in three stages, a 2-megacycle selection, a 0.1-megacycle selection, and a 50-kilocycle selection. The 2-megacycle selection and the 0.1-megacycle selection are accomplished by electrically driven stepping switches.

For the 2-mc selection, the whole megacycle selection (2) signals (figure 2-1) control the 2-mc stepper control relay (10) which, in turn, operates the 2-mc stepper (11). To choose one of the 20 0.1-megacycle bands in the selected 2 megacycles, the odd-even megacycle selection signals (6) and the fractional megacycle selection signals (5) are applied to the 0.1-mc stepper control relay (32) to operate the 0.1-mc stepper (33). The 2-mc stepper and 0.1-mc stepper (11 and 33) are automatically driven to a shaft position commanded by the particular code on the control wires. Thus, the 2-mc stepper (11) may be driven to any one of 22 shaft positions while the 0.1-mc stepper (33) may be driven to any one of 20 shaft positions. The shaft positioning provides mechanical control of the RA-22B r-f circuits. The shaft drives switch wafers which perform the frequency selection. The selection of the even or odd 50-kilocycle channel by means of the odd-even 50-kc selection signals (7) is performed directly by applying these signals to the 3rd oscillator (38) in the r-f circuits.

The frequency selection made by the 2-mc stepper (11) and the 0.1-mc stepper (33) is monitored by the communication and navigation switching circuits (3) to determine whether the channel selected is a communications channel or a navigation channel and, if a navigation channel is selected, to determine whether it is for ILS or VOR navigation. These circuits provide switching control through a comm-nav transfer relay (8) to the audio and avc circuits (9) in the RA-22B. This sets the correct mode of operation of these circuits for the type of channel selected. In addition, +27.5-volt outputs are provided to indicators that show selection of a communications channel or an ILS channel.

B. R-F AMPLIFIER

The VHF input (4) is supplied from a transmitter antenna relay to an r-f amplifier (12) that is tuned to one of the 44 whole-megacycle bands in the VHF input frequency range. This tuning is controlled by the shaft position of the 2-mc stepper (11) to select the desired 2-megacycle band, and by the shaft position of the 0.1-mc stepper (33) to select the even or odd whole megacycle. The shaft of the 0.1-mc stepper (33) positions an r-f amplifier tuning circuit (34) which provides electrical tuning control to the r-f amplifier (12). The 0.1-mc stepper shaft provides 20 positions and when the shaft is in any of the first ten positions, an even whole megacycle is indicated; when the shaft is in any of the second ten positions, an odd whole megacycle is indicated. Automatic volume control (avc) voltage is applied to the r-f amplifier to adjust the amplifier gain for a constant output carrier level.

C. FREQUENCY CONVERTER CIRCUITS

NOTE

As an aid in following the description of the frequency converter circuits, refer to figure 2-2 which illustrates a sample frequency conversion in graphic form.

The selected whole-megacycle band of VHF channels is supplied from the r-f amplifier (12) to the 1st mixer (16) where it is shifted to a lower frequency range. If the whole megacycle starts on an even megacycle (108.00, 110.00, 112.00, etc.) the whole megacycle will be shifted so that it has its first 50-kilocycle channel centered at 15.00 megacycles and its last at 15.95 megacycles. If the whole megacycle starts on an odd megacycle (109.00, 111.00, etc.) the whole megacycle will be shifted so that it has its first channel centered at 16.00 megacycles and its last at 16.95 megacycles. This is accomplished by using a local oscillator frequency which is changed for every second whole megacycle. A local oscillator frequency of 93.00 megacycles is used for the whole megacycles starting at 108.00 and 109.00 megacycles. The mixer difference frequency starts at 15.00 megacycles for an input starting at 108.00 megacycles and starts at 16.00 megacycles for an input frequency starting at 109.00 megacycles. Similarly, a local oscillator frequency of 95.00 megacycles is used for input frequencies starting at 110.00 and 111.00 megacycles. Since there are a total of 44 whole megacycles in the input frequency range and a different local oscillator frequency must be used for each pair of whole megacycles, it can be seen that one of 22 possible local oscillator frequencies must be selected for the 1st mixer (16). This selection is controlled by the 2-mc stepper (11).

The local oscillator frequency for the 1st mixer is generated at one half the desired frequency by the 1st oscillator (14). One out of 22 1st oscillator crystals (13) is selected by the frequency control circuits. The selected frequency (46.5, 47.5, 48.5, etc.) is then doubled by the frequency doubler (15) to produce the correct local oscillator frequency for the 1st mixer (16) (93.00, 95.00, 97.00 megacycles, etc., to 135.00 megacycles).

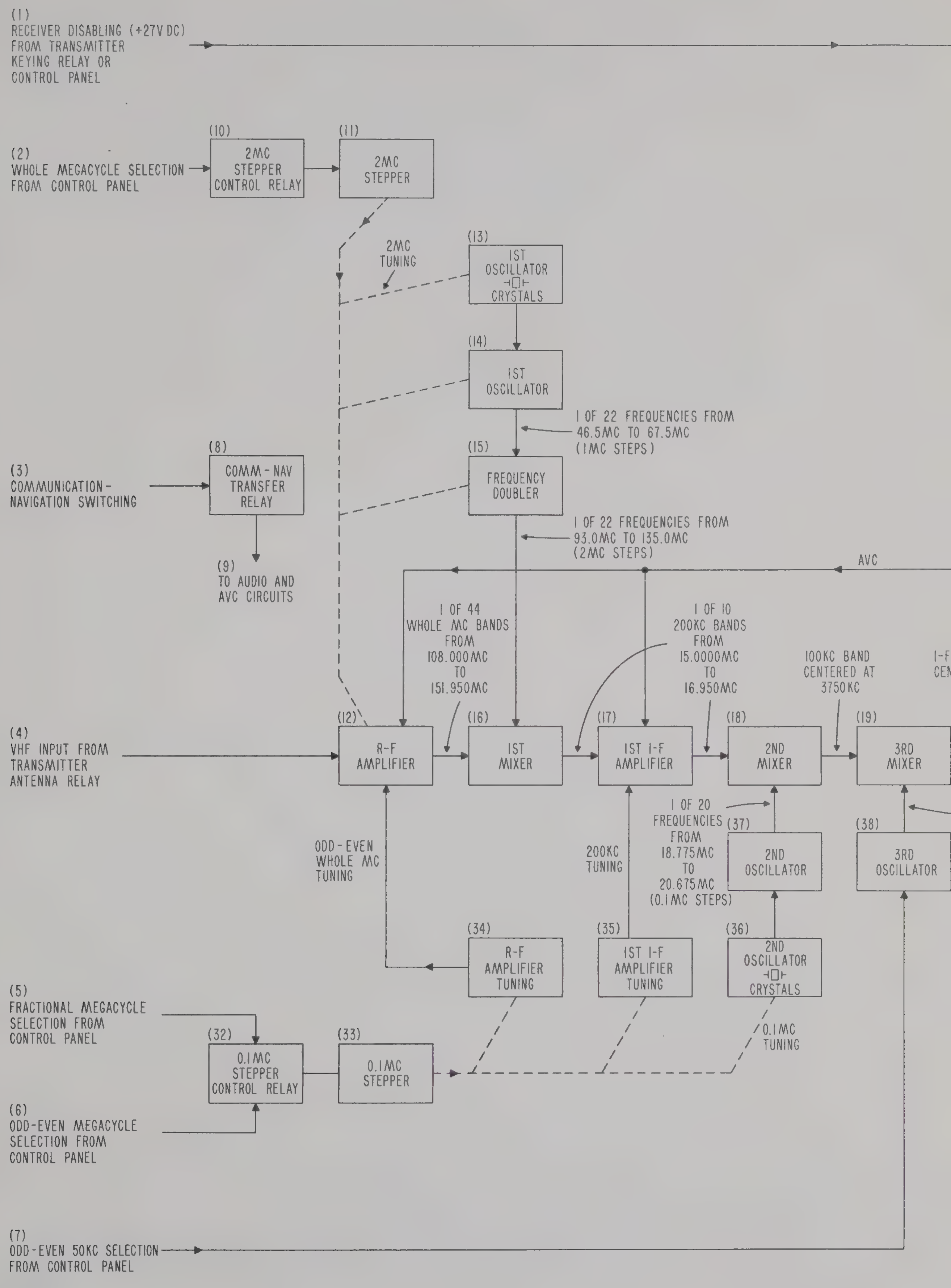


Figure 2-1. RA-22B VHF Receiver, Block Diagram

B. R-F AMPLIFIER

The VHF input (4) is supplied from a transmitter antenna relay to an r-f amplifier (12) that is tuned to one of the 44 whole-megacycle bands in the VHF input frequency range. This tuning is controlled by the shaft position of the 2-mc stepper (11) to select the desired 2-megacycle band, and by the shaft position of the 0.1-mc stepper (33) to select the even or odd whole megacycle. The shaft of the 0.1-mc stepper (33) positions an r-f amplifier tuning circuit (34) which provides electrical tuning control to the r-f amplifier (12). The 0.1-mc stepper shaft provides 20 positions and when the shaft is in any of the first ten positions, an even whole megacycle is indicated; when the shaft is in any of the second ten positions, an odd whole megacycle is indicated. Automatic volume control (avc) voltage is applied to the r-f amplifier to adjust the amplifier gain for a constant output carrier level.

C. FREQUENCY CONVERTER CIRCUITS

NOTE

As an aid in following the description of the frequency converter circuits, refer to figure 2-2 which illustrates a sample frequency conversion in graphic form.

The selected whole-megacycle band of VHF channels is supplied from the r-f amplifier (12) to the 1st mixer (16) where it is shifted to a lower frequency range. If the whole megacycle starts on an even megacycle (108.00, 110.00, 112.00, etc.) the whole megacycle will be shifted so that it has its first 50-kilocycle channel centered at 15.00 megacycles and its last at 15.95 megacycles. If the whole megacycle starts on an odd megacycle (109.00, 111.00, etc.) the whole megacycle will be shifted so that it has its first channel centered at 16.00 megacycles and its last at 16.95 megacycles. This is accomplished by using a local oscillator frequency which is changed for every second whole megacycle. A local oscillator frequency of 93.00 megacycles is used for the whole megacycles starting at 108.00 and 109.00 megacycles. The mixer difference frequency starts at 15.00 megacycles for an input starting at 108.00 megacycles and starts at 16.00 megacycles for an input frequency starting at 109.00 megacycles. Similarly, a local oscillator frequency of 95.00 megacycles is used for input frequencies starting at 110.00 and 111.00 megacycles. Since there are a total of 44 whole megacycles in the input frequency range and a different local oscillator frequency must be used for each pair of whole megacycles, it can be seen that one of 22 possible local oscillator frequencies must be selected for the 1st mixer (16). This selection is controlled by the 2-mc stepper (11).

The local oscillator frequency for the 1st mixer is generated at one half the desired frequency by the 1st oscillator (14). One out of 22 1st oscillator crystals (13) is selected by the frequency control circuits. The selected frequency (46.5, 47.5, 48.5, etc.) is then doubled by the frequency doubler (15) to produce the correct local oscillator frequency for the 1st mixer (16) (93.00, 95.00, 97.00 megacycles, etc., to 135.00 megacycles).

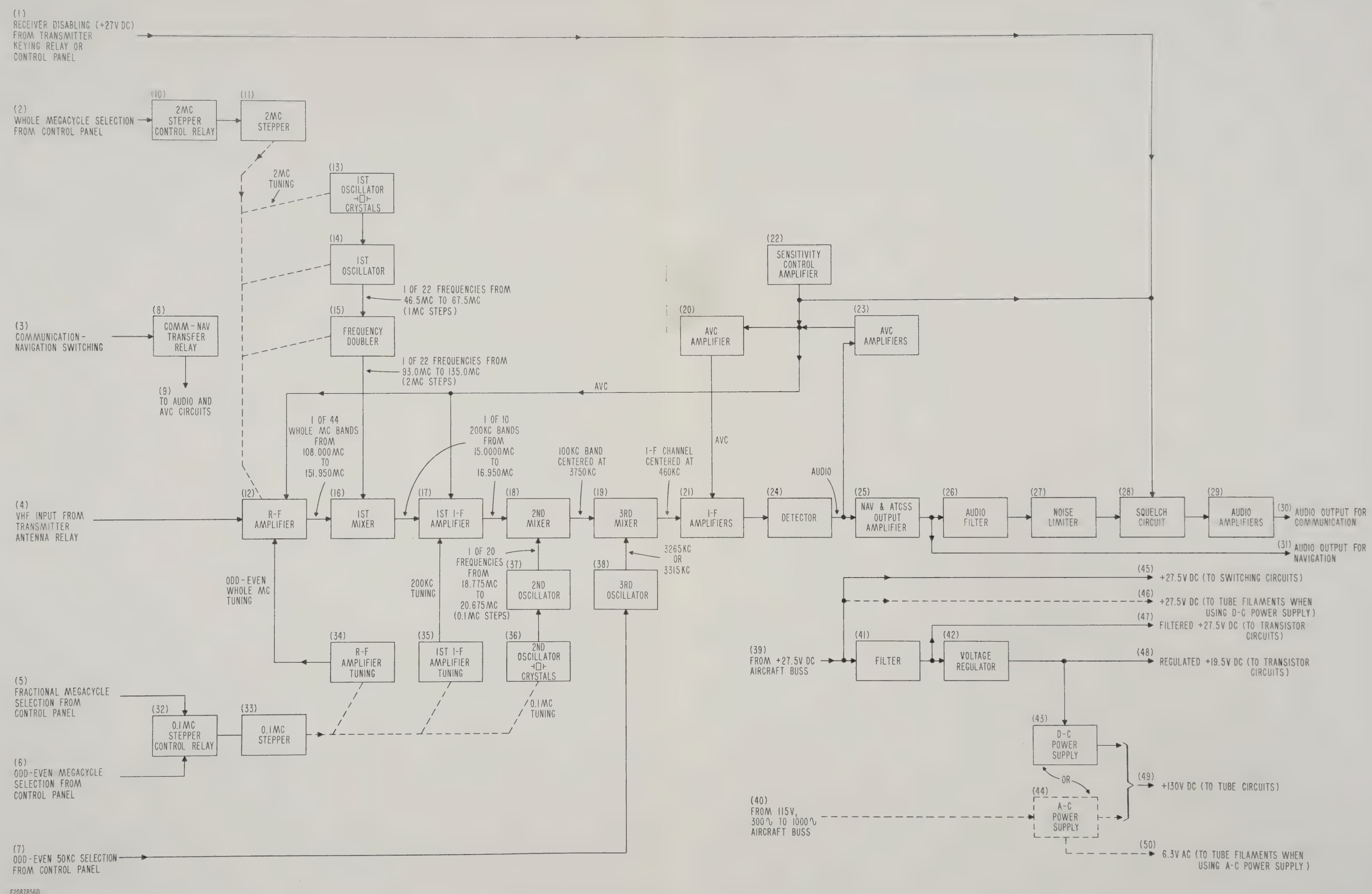
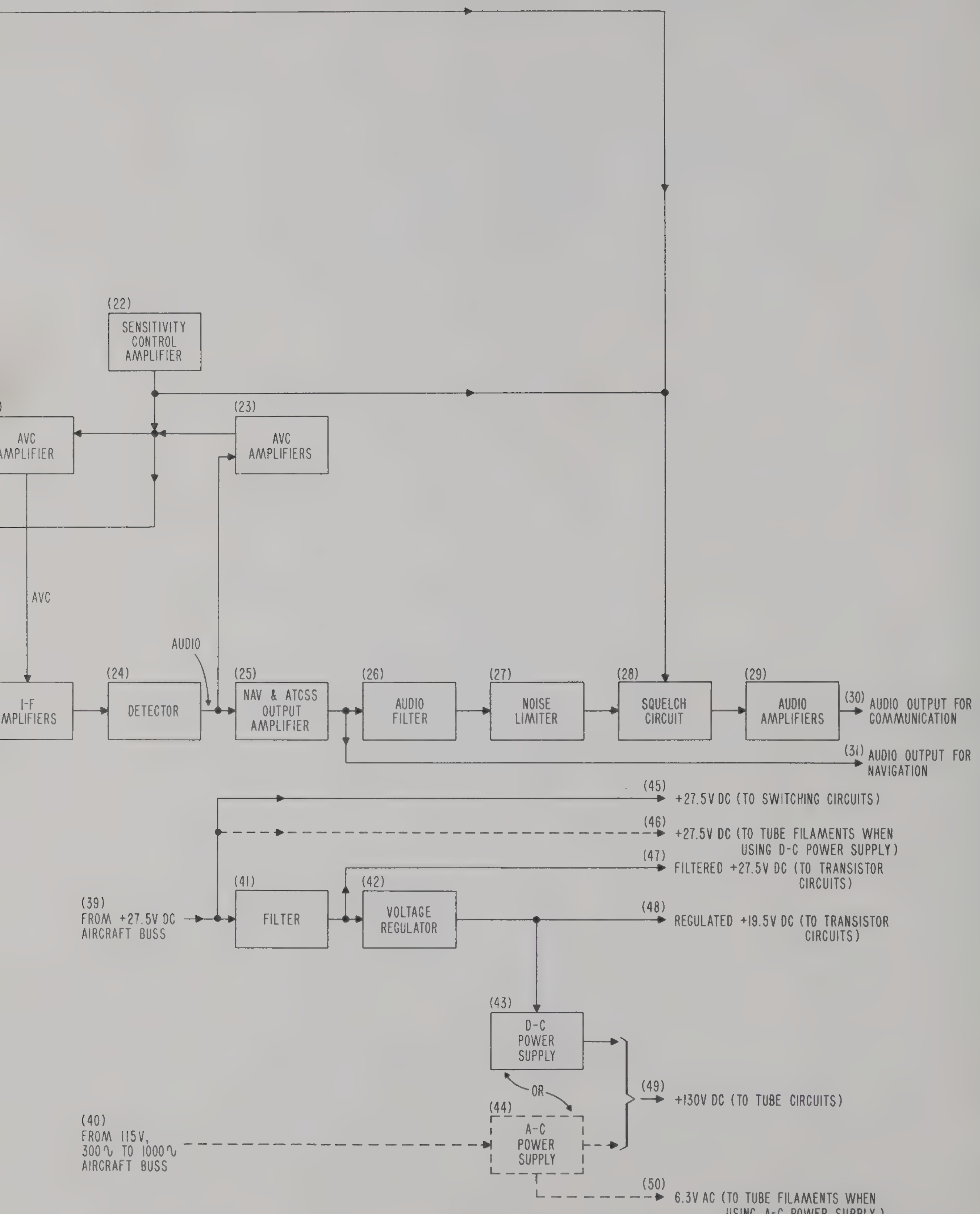


Figure 2-1. RA-22B VHF Receiver, Block Diagram



(22) SENSITIVITY CONTROL AMPLIFIER
AVC AMPLIFIER
(23) AVC AMPLIFIERS
AVC
AUDIO
I-F AMPLIFIERS
(24) DETECTOR
(25) NAV & ATCSS OUTPUT AMPLIFIER
(26) AUDIO FILTER
(27) NOISE LIMITER
(28) SQUELCH CIRCUIT
(29) AUDIO AMPLIFIERS
(30) AUDIO OUTPUT FOR COMMUNICATION
(31) AUDIO OUTPUT FOR NAVIGATION
(45) +27.5V DC (TO SWITCHING CIRCUITS)
(46) +27.5V DC (TO TUBE FILAMENTS WHEN USING D-C POWER SUPPLY)
(47) FILTERED +27.5V DC (TO TRANSISTOR CIRCUITS)
(41) FILTER
(42) VOLTAGE REGULATOR
(39) FROM +27.5V DC AIRCRAFT BUSS
(48) REGULATED +19.5V DC (TO TRANSISTOR CIRCUITS)
(43) D-C POWER SUPPLY
OR
(44) A-C POWER SUPPLY
(49) +130V DC (TO TUBE CIRCUITS)
(40) FROM 115V, 300∿ TO 1000∿ AIRCRAFT BUSS
(50) 6.3V AC (TO TUBE FILAMENTS WHEN USING A-C POWER SUPPLY)

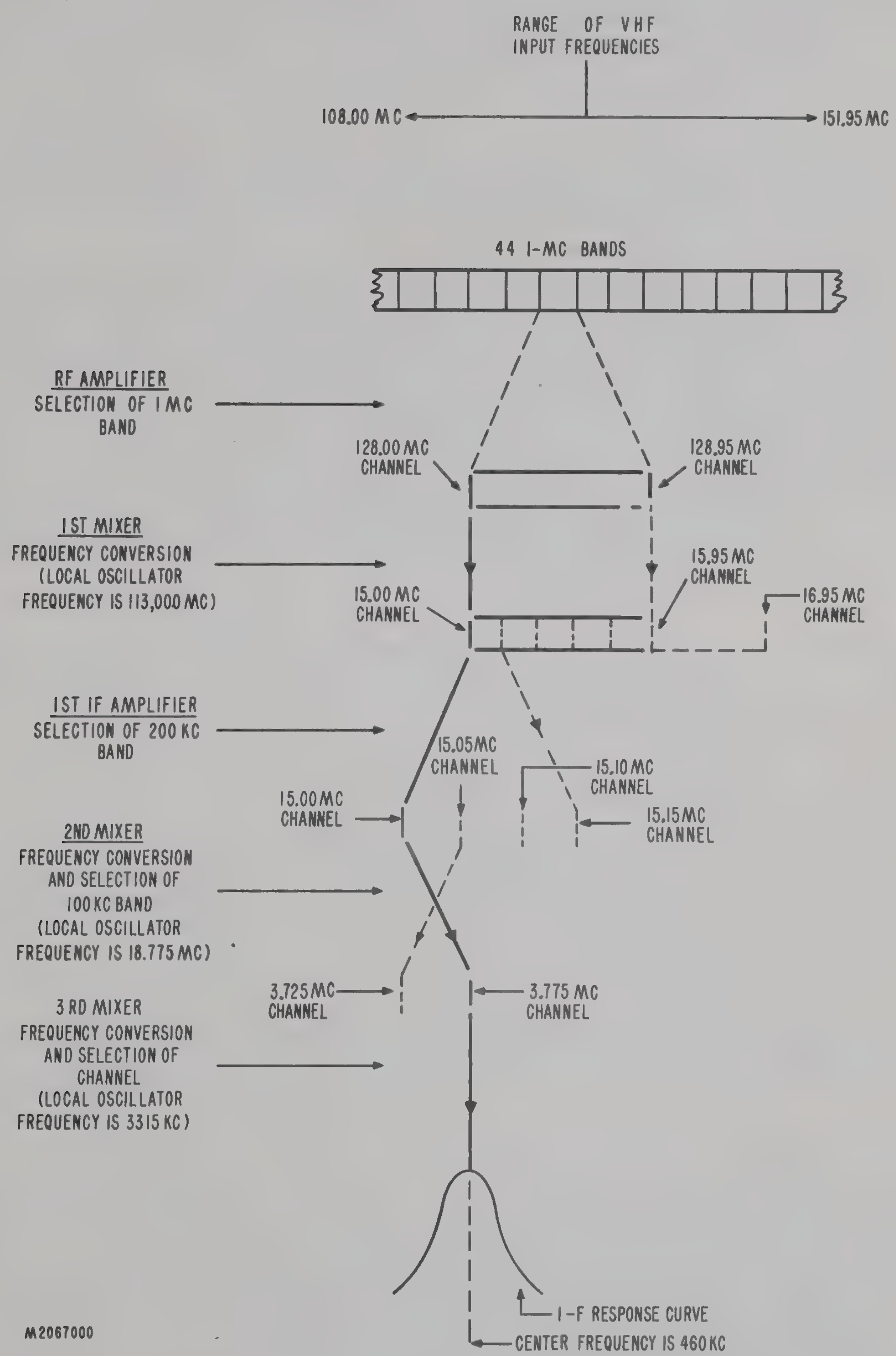


Figure 2-2. Sample Frequency Conversion, Graphic Representation

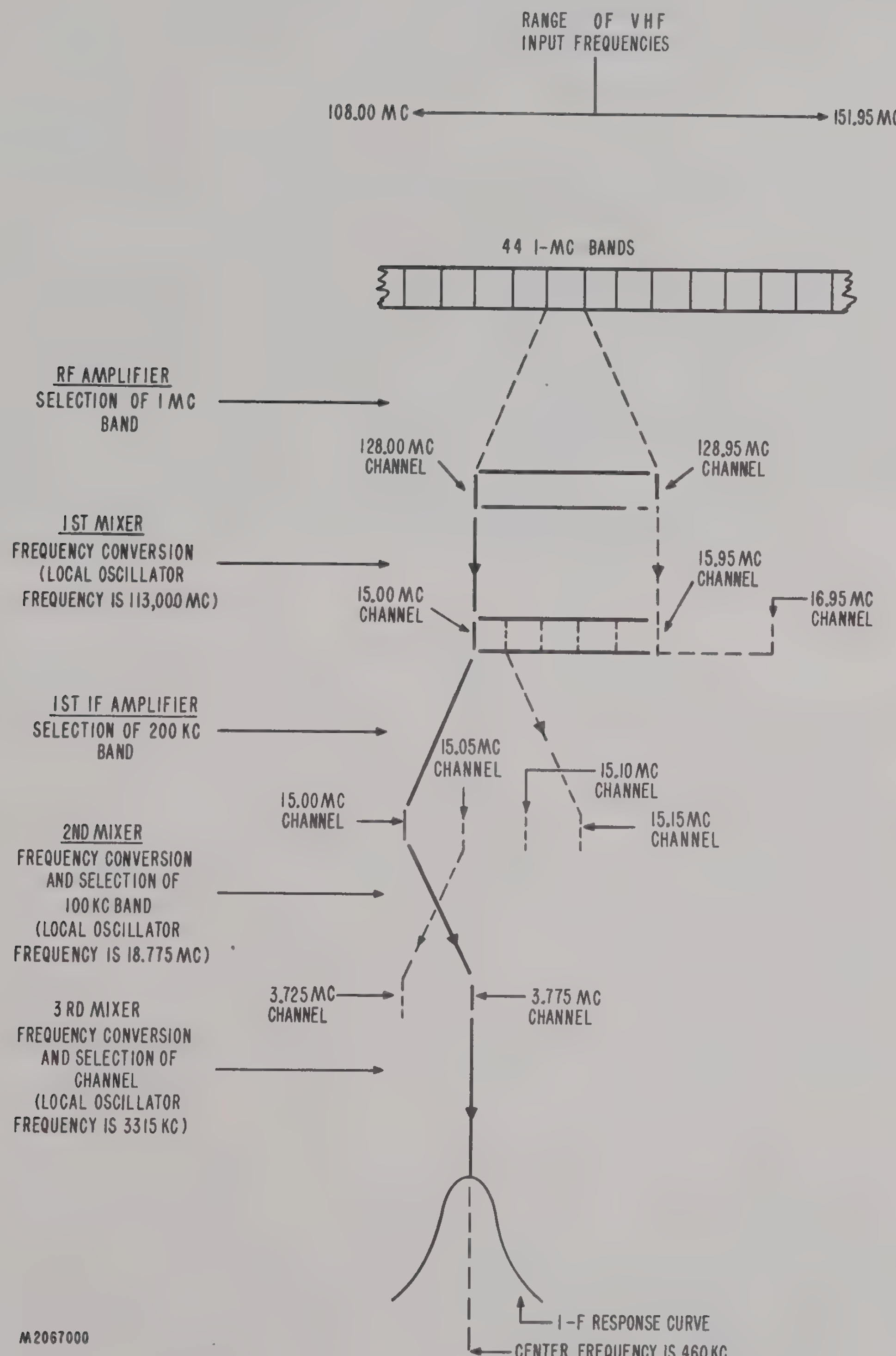


Figure 2-2. Sample Frequency Conversion, Graphic Representation

The whole-megacycle band of frequencies produced by the 1st mixer (16) is further amplified and tuned by the 1st i-f amplifier (17). This stage provides a flat response over a selected 200-kilocycle band. The first 200-kilocycle band that can be selected begins with the 50-kilocycle channel centered at 15.00 megacycles; the next begins with the 50-kilocycle channel centered at 15.200 megacycles, and so on to the 200-kilocycle band beginning with the 50-kilocycle channel centered at 16.80 megacycles. This provides a selection of one out of ten 200-kilocycle bands. The selection is controlled by an electrical switch circuit driven by the 0.1-mc stepper. Of course since the even or the odd whole megacycles are selected in the r-f amplifier, the 200-kilocycle band selected must be in the same whole megacycle.

The 200-kilocycle band of frequencies selected by the 1st i-f amplifier (17) includes four 50-kilocycle channels. The 2nd mixer (18) switching selects a 100-kilocycle band containing either the first two channels or the second two channels. The two selected channels are shifted so that the first (even) channel is at 3.775 megacycles and the second channel (odd) is at 3.725 megacycles. Since any one of ten 200-kilocycle bands of frequencies may be supplied to the 2nd mixer (18) from the 1st i-f amplifier (17), a selection of one of twenty 100-kilocycle bands must be made in the 2nd mixer (18). This is accomplished by operating the 2nd oscillator (37) at one out of 20 possible frequencies to provide the correct local oscillator frequency for shifting the two channels in the desired 100-kilocycle band to 3.775 and 3.725-megacycles.

As an example, consider the first 200-kilocycle band that can be selected by the 1st i-f amplifier (17). It starts with the 50-kilocycle channel centered at 15.00 megacycles and also contains the 50-kilocycle channels centered at 15.05, 15.10, and 15.15 megacycles. To select either of the first two channels, the local oscillator frequency of 18.775 megacycles provided by the 2nd oscillator (37) is used. The 15-megacycle channel is an even channel; so the difference frequency is 3.775 megacycles. The difference frequency for the 15.05-megacycle channel, an odd channel, is 3.725 megacycles. To select the 15.10- and 15.15-megacycle channels, a 2nd oscillator (37) frequency of 18.875 megacycles is used. To select the first two channels (15.20 and 15.25 megacycles) of the next 200-kilocycle band, a frequency of 18.975 megacycles is used, and so on. In this manner the 2nd oscillator (37) provides a selection of 20 output frequencies at 100-kilocycle increments, starting at 18.775 megacycles and ending at 20.675 megacycles. The local oscillator frequency at the 2nd mixer (18) is always higher than the signal frequency and the mixer output difference frequency is 3.725 megacycles for the higher (odd) channel and 3.775 megacycles for the lower (even) channel of the selected pair.

The selection of the even or odd 50-kilocycle channel is made at the 3rd mixer (19). The output circuit of the 3rd mixer (19) is tuned to 460 kilocycles, and a local oscillator running at 3.315 megacycles is required to shift the even 50-kilocycle channel to this frequency. A 3.265-megacycle oscillator frequency is required to shift the odd 50-kilocycle channel to the 460-kilocycle frequency. The 3.315- and 3.265-megacycle frequencies are supplied by the 3rd oscillator (19) in accordance with a selection made by the odd-even 50 kc selection signals (7). The resulting 50-kilocycle channel centered at 460 kilocycles is narrowed to 40 kilocycles, at the 6-db points, by the output circuits of the 3rd mixer (19). This is done to prevent interference from neighboring channels. The 460-kilocycle frequency is the final i-f of the RA-22B.

D. I-F AMPLIFIERS

Seven cascaded transistor i-f amplifiers (21) raise the i-f signals to the power level necessary for audio detection. Automatic volume control (avc) is applied to the first and third stages to maintain a constant input level.

E. AUDIO CIRCUITS

The amplified i-f signals are applied to a detector (24) to extract the audio. The audio signal voltage produced by the detector (24) is routed through a nav and atcss output amplifier (25) that provides a low impedance audio output for navigation (31). For communication purposes, the output is applied to an audio filter (26) that narrows the audio band to prevent interference from adjacent channels. The filtered audio is passed through a noise limiter (27) which removes noise spikes from the signal. The audio signal is then applied to a squelch circuit (28) which automatically squelches the audio whenever the carrier drops below a level determined by a sensitivity control amplifier (22), in the avc circuit. Squelch can be disabled by pressing the SQUELCH TEST switch on the front panel. Squelch can also be commanded by a +27 VDC receiver disabling signal (1) from the associated transmitter or from the remote control panel. The audio signal passed by the squelch circuit (28) is applied to a set of audio amplifiers (29) to develop a low impedance audio output for communication (30).

F. AVC AND SQUELCH CIRCUITS

The output of the detector (24) is applied to a set of avc amplifiers (23) where it is amplified and the audio component removed. The resultant d-c voltage, known as the raw avc, is used to control the squelch circuit (28).

Squelch control is effected by comparison of the raw avc voltage with a reference voltage amplitude, established by adjustment of the SENS (sensitivity) control on the receiver front panel. The sensitivity control amplifier (22) samples each voltage and so long as the raw avc is exceeded by the reference voltage, the squelch circuit (28) is operative. When the r-f input to the receiver is sufficient to generate an avc voltage greater than the reference voltage, the sensitivity control amplifier (22) loses control of the squelch and the circuit becomes disabled.

The output of the sensitivity control amplifier (22) is called r-f avc because it is the control voltage applied to the r-f amplifier (12). The r-f avc is also applied to an avc amplifier (20) where it is used as the control voltage for the i-f amplifiers (21).

G. POWER SUPPLY CIRCUITS

The RA-22B receives power from the +27.5 VDC aircraft bus (39). This input is used directly as the +27.5 VDC power (45) to operate the various relay switching circuits for frequency selection. A filter (41) removes high voltage transients, and the filtered +27.5 VDC (47) power is supplied to some of the transistor circuits and to a voltage regulator (42) that produces a regulated +20 VDC output. This voltage is used as the primary input of the d-c power supply (43) and for the various transistor circuits that are more sensitive to supply variations. The 130-volt B+ for the vacuum tube circuits may be derived either from the d-c power supply (43) or from an a-c power supply (44) which receives primary input

from the 115-volt 300- to 1000-cps aircraft bus. The a-c power supply (44) also provides 6.3 vac (50) for the tube filament power. The +27.5 VDC (39) from the aircraft bus is connected as a +27.5 VDC (46) supply in a series-parallel configuration to provide +6.3 volts dc across each tube filament when the d-c power supply (43) is used for B+.

2-2. CIRCUIT DESCRIPTION

A. FREQUENCY CONTROL WIRES

The whole megacycle selection is coded on seven control wires (figure 6-1), designated A, B, C, D, N, M, and J. The fractional megacycle selection is coded on six control wires, designated E, F, G, H, K, and L. Each frequency selection is coded by a particular combination of grounded and open-circuited control wires. For the whole megacycle selection, the A, B, C, D, and N control wires provide 22 possible combinations to select any of the twenty-two 2-megacycle bands in the RA-22B frequency range. The first or second (even or odd) whole megacycle within any 2-megacycle band is determined by the M and J control wires.

For the fractional megacycle selection, the E, F, G, and H control wires provide 10 possible combinations to select any of the ten 0.1-megacycle bands in the selected whole megacycle. The first or second (even or odd) 50-kilocycle channel in each 0.1-megacycle band is determined by the K and L control wires.

B. TWO-MEGACYCLE STEPPER

The coding of the A, B, C, D, and N control wires for the two-megacycle selection is given in figure 2-3. Note that for each frequency one or more of the A, B, C, and D control wires are grounded while the ungrounded wires are connected together. Note also that although there are 22 possible 2-megacycle selections, there are only 14 combinations of the A, B, C, and D control wires. These combinations are used from the 108-megacycle selection through to the 134-megacycle selections with the N control wire grounded. The eight A, B, C, and D combinations from the 136-megacycle to the 150-megacycle selections repeat the eight combinations from the 108-megacycle to the 122-megacycle selection except for the sequence.

The frequency selections from 136 megacycles to 150 megacycles are distinguished by the fact that the N control wire is ungrounded.

The A, B, C, and D control wires are connected to stator contacts on the front and rear of "2 mc selection" switch wafer S101A. This switch wafer is mounted on a 24-position shaft, of which 22 positions represent the 22 possible 2-megacycle selections, and two positions are unused. The rotors of this switch wafer are shown in figure 6-1 in the position corresponding to the 116-megacycle frequency selection. Referring to figure 2-3, note that for this selection, control wires A and B are ungrounded, while control wires C and D are grounded by contacts in the control panel. The rotor of the front section of the S101A wafer is ungrounded when it is in the correct position for the frequency selection being made.

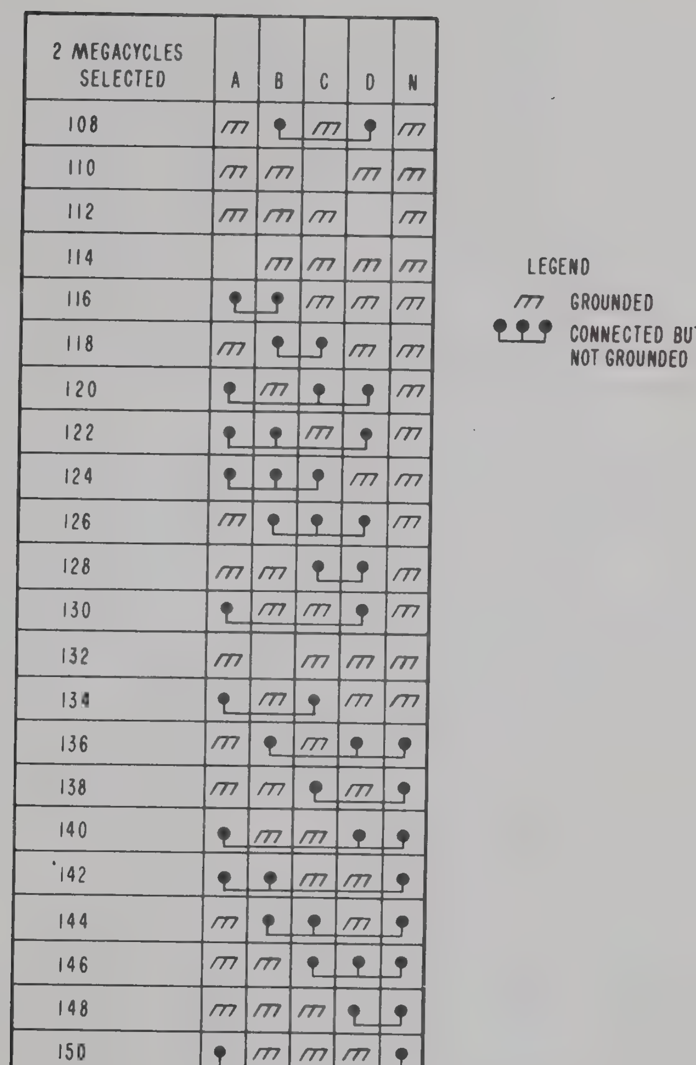


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Figure 2-3. Coding Chart for Two-megacycle Stepper

If the rotor is in any other position, one or both of the grounded C and D control wires will be connected to the rotor. In general, for any frequency selection, the rotor of the front section of S101A will be grounded if it is not at the correct position for the selected combination of A, B, C, and D control wires.

Since the rotor of the front section of S101A is tied to the solenoid of "2 mc stepper control relay" K101, this relay is energized whenever the S101A rotor is not at the position for the selected combination of A, B, C, and D control wires. The normally open contacts of K101 are closed and route d-c power through the normally closed contacts of "2 mc stepper" relay K102 to the K102 solenoid. This solenoid drives the 24-position shaft to its next higher frequency position. The normally closed contacts of K102 are interrupter contacts which, when the K102 solenoid is energized, permit the stepper to release and reset. If the new position is still not correct for the selected combination of A, B, C, and D control wires, K101 will remain energized and the solenoid of K102 will be actuated again. The process continues until the shaft position for the selected frequency is achieved. In this position an open circuit appears at the coil of K101 and the relay is deenergized, disabling the stepper. Diode CR102 is connected across the coil of K102 to damp the voltage induced when the interrupter contacts open. The damping also reduces the stepping rate, increasing reliability.

Since some of the coding of the A, B, C, and D control wires used for frequency selections in the upper range from 136 to 150 megacycles is also used in the lower range from 108 to 131 megacycles, the rotor of S101A will open the circuit to the coil of K101 for the correct A, B, C, and D code in the upper range as well as in the lower range. In order to prevent the stepping switch from stopping at a frequency position in the upper range when the lower range is selected (the N control wire grounded), the N control wire is connected to the rotor on the front of "2 mc switch wafer" S101B. This rotor is mounted on the same 24-position shaft as S101A. When the shaft is in any of the frequency positions from 136 to 150 megacycles, the rotor is connected to stator pin 21. Thus, stator pin 21 will be at ground if the shaft is in any of these positions when the N control wire is grounded. This ground is routed to the coil of "2 mc stepper control relay" K101 to energize K101 and prevent the stepper from stopping.

The rotor contacts on the rear section of switch wafer S101A are exactly the reverse of the rotor contacts on the front section; so the rear rotor shorts out all stator contacts that are not contacted at the front section for any position. When the shaft stops at the correct position for the selected A, B, C, and D code, the ungrounded control wires will be connected together by the front rotor and the grounded control wires will be connected together by the rear rotor. A number of other switching wafers are mounted on the shaft of "2 mc stepper" K102. These wafers are illustrated in "detail A" at the right of figure 6-1. For the purpose of this instruction book these switch wafers will be considered as part of the functional circuits to which they are electrically connected. However, since the switch wafers are mounted on the "2 mc stepper" shaft, the switching functions they perform depend on the particular 2-megacycle selection.

C. TENTH-MEGACYCLE STEPPER

The coding of the E, F, G, and H control wires for the one-tenth megacycle selection is given in figure 2-4. Note that there are ten combinations corresponding to the ten possible one-tenth megacycle selections within a selected whole megacycle range. The determination of the odd or even whole megacycle is controlled by the M and J control wires. For the even selection, M is grounded; for the odd selection, J is grounded.

The E, F, G, and H control wires are applied to stator contacts on the front and rear of "0.1 mc selection" switch wafer S102A. The M and J control wires are applied to stator contacts on the rear of "odd-even mc range" switch wafer S102B. These wafers are mounted on a 20-position shaft with positions representing the 20 possible 0.1-megacycle selections in any 2-megacycle range. The rotors are shown in figure 6-1 in the position corresponding to the first 0.1-megacycle selection (from zero to 0.1 megacycle). Referring to figure 2-4, note that for this selection, the E control wire is grounded, the F, G, and H control wires are ungrounded, the M wire is grounded, and the J wire is ungrounded. Thus, the rear rotors of both S102A and S102B are ungrounded when the shaft is in the position for the selected code. When the shaft is not in the position for the E, F, G, and H code, the rear rotor of S102A is grounded. When the shaft is not in the position for the M and J code, the rear rotor of S102B is grounded. In either case, the grounded rotor energizes the "0.1 mc stepper control relay" (K103). As long as this relay is energized it enables "0.1 mc stepper" solenoid K104 to step the shaft one position at a time toward increasing frequencies in the same way as "2 mc stepper" K102.

The various switching wafers mounted on the shaft of "0.1 mc stepper" K101, are illustrated in "detail A" at the right of figure 6-1. These wafers will be considered as part of the various functional circuits to which they are electrically connected. However, since they are mounted on the "0.1 mc stepper" shaft, the switching functions they perform depend on the particular one-tenth megacycle selection.

D. COMMUNICATION AND NAVIGATION SWITCHING

Normally the channels from 108.00 to 117.95 megacycles are used for navigation while the channels from 118.00 to 151.95 megacycles are used for communication. A 27.5-volt output on all communication channels is provided by the combined stator contacts of the front and rear of "comm and ils function" switch wafer S101D. This wafer is mounted on "2 mc stepper" switch shaft. The S101D contacts provide a 27.5-volt output for all 2-megacycle selections from 118 to 150 megacycles. Stator contact 22 on the rear of S101D is used in conjunction with an external "comm-nav transfer" ground input at pin 3 of P1 when it is desired to extend the range of communications channels down to 116.00 megacycles. In this case, "comm-nav transfer relay" K105 is energized whenever a channel in the 116.00 to 117.95 range is selected; then the contacts of K105 disable all navigation switching functions in the circuits of the RA-22B. These switching functions are described in the discussions of the applicable circuits.

Within the navigation frequency range from 108.000 to 117.950 megacycles, the odd one-tenth megacycles from 108.1 to 111.9 megacycles are assigned to ILS functions. A 27.5-volt output on all ILS channels is provided by the RA-22B. This signal is derived from stator contact 10 on the rear of S101D. For either the 108 or the 110 2-megacycle selection, this contact applies 27.5 volts through the normally closed contacts of "2 mc stepper control relay" K101 and "0.1 mc stepper control relay" K102

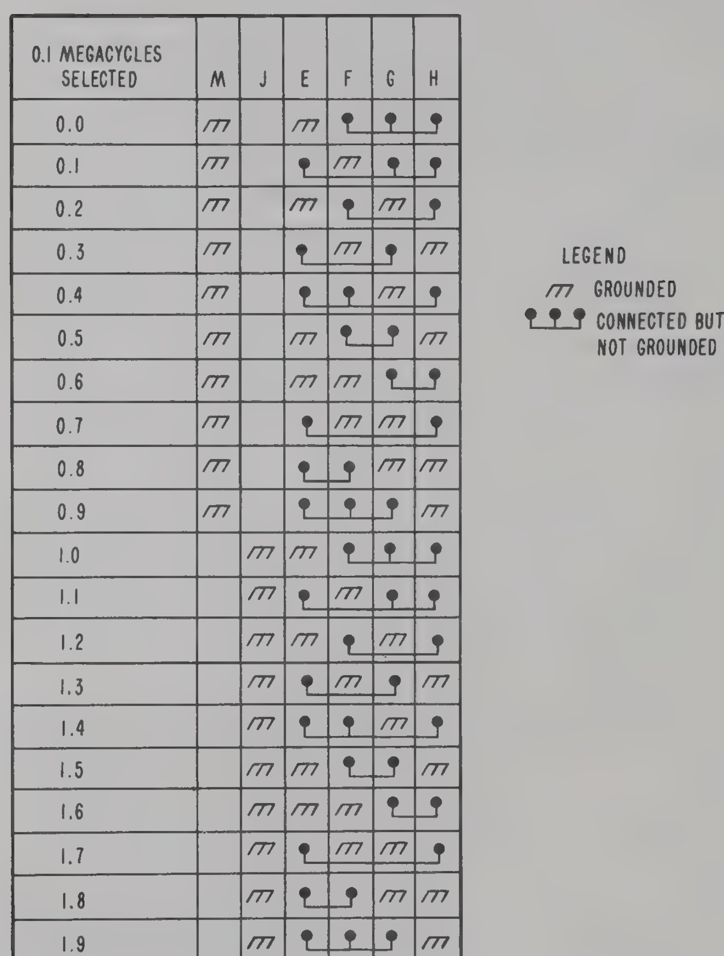

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Figure 2-4. Coding Chart for Tenth-Megacycle Stepper

to the stator contact of "ils function" switch wafer S102B front. The signal appears at S102B only after the stepper switches have settled at the correct position for the selected frequency. Switch wafer S102B is mounted on the "0.1 mc stepper" shaft and its rotor is constructed so that contact is made for every odd 0.1 megacycle frequency selection. The signal at the rotor is applied to "+27.5 volts on ils" output at pin 27 of P1.

E. R-F AMPLIFIER CIRCUITS

1. Input Circuits

The VHF signals received by the antenna are applied to the receiver at coaxial pin A1 of plug P1 (figure 6-1). The signals are routed through a short section of coaxial cable to the junction of capacitors C201 and C202, to provide an impedance match for the antenna input. The antenna signals are then routed through two identical, parallel-resonant circuits that serve as the input circuits to the "r-f amplifier". Capacitive coupling is provided by capacitors C207 and C208.

The parallel-resonant circuits have a flat response over a 1-megacycle band (1.5 megacycles between the 3-db points). The 1-megacycle pass-band can be tuned to any one of the 44 whole-megacycle increments. The tuning requires two operations in each parallel-resonant circuit. One of the twenty-two 2-megacycle bands, starting on an even frequency (108.000, 110.000, etc), is selected by setting printed inductance switching wafers L202 and L204 to any one of 22 inductance values. These wafers are mounted on the shaft of the "2 mc stepper" switch operated by the frequency control circuits (refer to paragraph 2-2.A.). Within each 2-megacycle band, the selection between the even and odd megacycle is accomplished by setting the effective capacitance of varicaps CRC201 and CRC202. The effective capacitance of the varicaps depends on the d-c bias voltage applied to them. For even megacycle selections, the bias is set at approximately 28 volts, and for odd selections approximately 44 volts. The biasing signals are switched by "rf varicap voltage" switch S102 front. This switch is operated by the "0.1 mc stepper" in the frequency control circuits (refer to paragraph 2-2.B.). The first ten positions of this switch select the even megacycle while the second ten select the odd megacycle. Capacitors C203 and C205 in the parallel-resonant circuits are used for alignment.

2. Amplifier Circuits

The "r-f amplifier" is made up of cathode follower V201A driving grounded-grid amplifier V201B to provide a low-noise combination. Avc voltage is supplied to both grids of the "r-f amplifier", through decoupling resistors R204 and R213. The high resistance of R204 and R213 prevents the bleeding off of r-f current, while still permitting the full avc bias voltage at the grids. The avc voltage applied to the grids of the "r-f amplifier" is approximately +14 volts, in the absence of signal. Resistors R207 and R212 form a bleeder from the +20V line, to hold the cathodes of V201A and V201B at a constant positive potential that is not affected by variations in the avc bias at the grids.

3. Output Circuits

The amplified r-f signals produced at the plate of V201B are routed through two parallel-resonant circuits that serve as the output circuits of the "r-f amplifier". These are similar to the two parallel-resonant circuits at the input (paragraph 2-2.E.1.) and perform the same function. Selection of the

desired 2-mc band is accomplished by etched circuit inductance wafers L206 and L208 which are mounted on the same shaft as L202 and L204 in the input circuit. Selection between the even and odd megacycle is accomplished by the back-bias voltage to varicaps CRC203 and CRC204 in the same way as for CRC201 and CRC202 in the input circuit.

F. FREQUENCY CONVERTER AND I-F CIRCUITS

1. First Mixer

The r-f signals produced by the output circuits of the "rf amplifiers" are capacitively coupled to the grid of "1st mixer" V202. The local oscillator voltage is applied to the cathode of V202 where it can be measured at jack J201 (TP1). The local oscillator frequency is selected by the frequency control circuits as one of the 22 frequencies that occur every 2 megacycles from 93.000 to 135.000 megacycles inclusive. The local oscillator frequency is selected so that when the "rf amplifier" is tuned to an even megacycle (108.000, 110.000, etc) the mixer output is a whole megacycle with the first 50-kc channel centered at 15.000. Similarly, when the "rf amplifier" is tuned to an odd megacycle (109.000, 111.000, etc.) the mixer output is a whole megacycle with the first 50-kc channel centered at 16.000 megacycles.

2. First Oscillator and Doubler

The local oscillator frequency for the "1st mixer" is generated at one-half the required frequency by "1st oscillator" V205A, making 22 crystal-controlled frequencies available for V205A, spaced 1 megacycle apart (46.5, 47.5, 48.5, etc to 67.5 megacycles). The required frequency is automatically selected by "1st oscillator crystal select" switch wafer S101L. This switch is operated by the "2 mc stepper" in the frequency control circuit. The crystal selected by S101L acts as a series resonant circuit. Each crystal is cut so that it resonates at its fifth overtone. The oscillator plate tank circuit is tuned to the resonant frequency of the selected crystal by printed inductance switching wafer L210. This wafer is mounted on the same shaft as S101L and provides 22 inductance values corresponding to the 22 crystal frequencies. The plate tank circuit is aligned by adjusting calibration capacitor C264. Plate-to-cathode positive feedback, to sustain oscillations, is applied by a voltage divider consisting of capacitor C262 as one arm and capacitor C263 in parallel with inductor L213 and resistor R243 as the other arm.

The selected frequency produced by the "1st oscillator" is capacitively coupled to the grid of "doubler" V205B. This stage is operated in class B_2 so the various harmonics of the input frequency are generated in the tube. The plate tank circuit of V205B is tuned to the second harmonic of the "1st oscillator" frequency by printed inductance switching wafer L212. This wafer provides 22 inductance values that are used to tune the 22 possible local oscillator frequencies (from 93.000 megacycles to 135.000 megacycles) of the "1st mixer". L212 is mounted on the same shaft as S101L and L210 in the "1st oscillator", so that all selections are synchronized. Alignment of the "doubler" plate tank circuit is provided by calibration capacitor C272.

3. First I-f Amplifier

The input to "1st if amplifier" V203 in the 15.000 to 16.950-megacycle frequency range is taken from the plate circuit of "1st mixer" V202. The input circuits to V203 consist of two parallel-resonant circuits coupled by capacitor C234. The two parallel-resonant circuits may be tuned to any one of the ten 200-kilocycle bands in the 2-megacycle input range of the "1st if amplifier". Tuning is accomplished by selecting one of ten biasing voltages available for application to varicaps CRC205 and CRC206. The selected voltage is connected by "1st if varicap voltage" switch S102C rear, mounted on the "0.1 mc stepper" shaft. Each stop on this shaft represents 1/10 megacycle; so each second stop represents 2/10 megacycles, or 200 kilocycles. Rotating the shaft sets the effective capacitance of CRC205 and CRC206 at one of ten values, depending on which 200-kilocycle band is selected. The first five of the ten possible 200-kilocycle bands are used when an even megacycle is selected in the "rf amplifier", and the second five are used when an odd megacycle is selected. Inductors L221 and L222 are used for alignment.

The amplified i-f signals produced at the plate of V203 are routed through two parallel-resonant circuits that serve as the output circuits of the "1st if amplifier". These are similar to the two parallel-resonant circuits at the input, and perform the same function. Thus, the frequency control bias voltage, which sets the effective capacitance of varicaps CRC205 and CRC206 in the input circuits, is also used to set the effective capacitance of varicaps CRC207 and CRC208 in the output circuits. Inductors L223 and L224 are used for alignment.

4. Second Mixer

The 200-kc band of i-f signals available at the output circuits of the "1st if amplifier" is applied to the grid of "2nd mixer" V204A. The local oscillator voltage for this stage is applied to the cathode of V204A where it can be measured at jack J203 (TP3). The local oscillator frequency, selectable through the frequency control circuits, is one of the 20 frequencies occurring at 0.1-megacycle intervals from 18.775 mc to 20.675 mc inclusive (18.775, 18.875, 18.975, etc).

The output of the "2nd mixer" is tuned by four parallel-resonant output circuits to a flat response in the 100-kc band from 3.7 megacycles to 3.8 megacycles. Successive 100-kilocycle increments in local oscillator frequency are used to select successive 100-kilocycle bands in the 2-megacycle band from 15.00 to 16.95 megacycles, available at the "1st if amplifier".

The four parallel-resonant circuits that form the output circuits of the "2nd mixer" are adjusted to the 3.700 to 3.800 megacycle band by inductors L225, L301, L302, and L303. Note that the first of the four parallel-resonant circuits is not mounted on the same chassis as the last three. A coaxial line is used to pass the signal from one chassis to the other.

5. Second Oscillator

The local oscillator frequency for the "2nd mixer" is generated in "2nd oscillator" V204B. This stage can be operated at any one of 20 crystal-controlled frequencies spaced at 0.1 megacycle from 18.775 to 20.675 megacycles. The required frequency is automatically selected by "2nd oscillator crystal select" switch wafer S102D. This switch is operated by the "0.1 mc stepper". The circuit

2-2.F.5. (Cont'd)

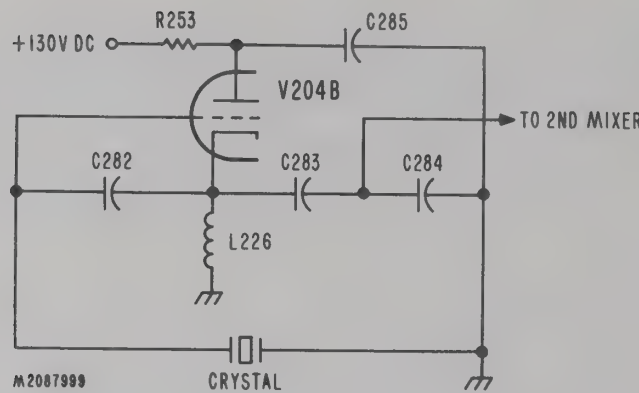

Figure 2-5. Second Oscillator, Simplified Schematic Diagram

of V204B is redrawn in figure 2-5 to illustrate the operation of the "2nd oscillator". The components of the oscillator are rearranged in the figure to point up the fact that it is basically a grounded-plate Colpitts oscillator, with the selected crystal replacing the inductance between plate and grid. Positive feedback to sustain oscillations is coupled from plate to grid through capacitors C285, C284, C283, and C282. Inductor L226 is an r-f choke and is used to complete the d-c supply path.

6. Third Mixer

The "3rd mixer" receives either the even or odd 50-kc channel and shifts it to a center frequency of 460 kc. The 100-kc band of i-f signals produced at the output circuits of the "2nd mixer" are applied to the emitter of "3rd mixer" Q301. The local oscillator frequency is applied, from the "3rd oscillator", to the base of Q301. The "3rd oscillator" frequency is either 3315 kc or 3265 kc. When an even 50-kc selection is desired, 3315 kc is selected so that the 3.775-mc center frequency signal received from the "2nd mixer" results in a difference frequency of 460 kc. When an odd 50-kc selection is desired, 3265 kc is selected so that the 3.725-mc center frequency from the "2nd mixer" results in a difference frequency of 460 kc. The mixer output at the collector of Q301 is applied to "460-kc filter" FL301. This filter is factory-adjusted to a bandwidth of 40-kc, at the 6-db points.

7. Third Oscillator

The "3rd oscillator" consists of two separate but similar crystal-controlled oscillators (Q310 and Q311). The two oscillators are energized, one at a time, by the odd and even 50-kc control wires, K and L. For an odd 50-kc selection, control wire K is grounded and control wire L is left floating. This turns on oscillator Q311, which oscillates at 3265 kc, the resonant frequency of crystal Y302. For an even 50-kc selection, control wire L is grounded and control wire K is left floating. This turns on oscillator Q310 which oscillates at 3315 kc, the resonant frequency of crystal Y301. The circuit of Q311 is redrawn in figure 2-6 to illustrate the operation of these oscillators. The components in this figure are rearranged to point out the fact that it is basically a Pierce oscillator with crystal Y302 operating in parallel resonance. The output voltage of the oscillator is an a-c voltage developed across resistor R302. Operating current for the transistor is supplied to the emitter only when the K control wire is grounded. The return line to the B+ supply is decoupled for ac by inductor L305.

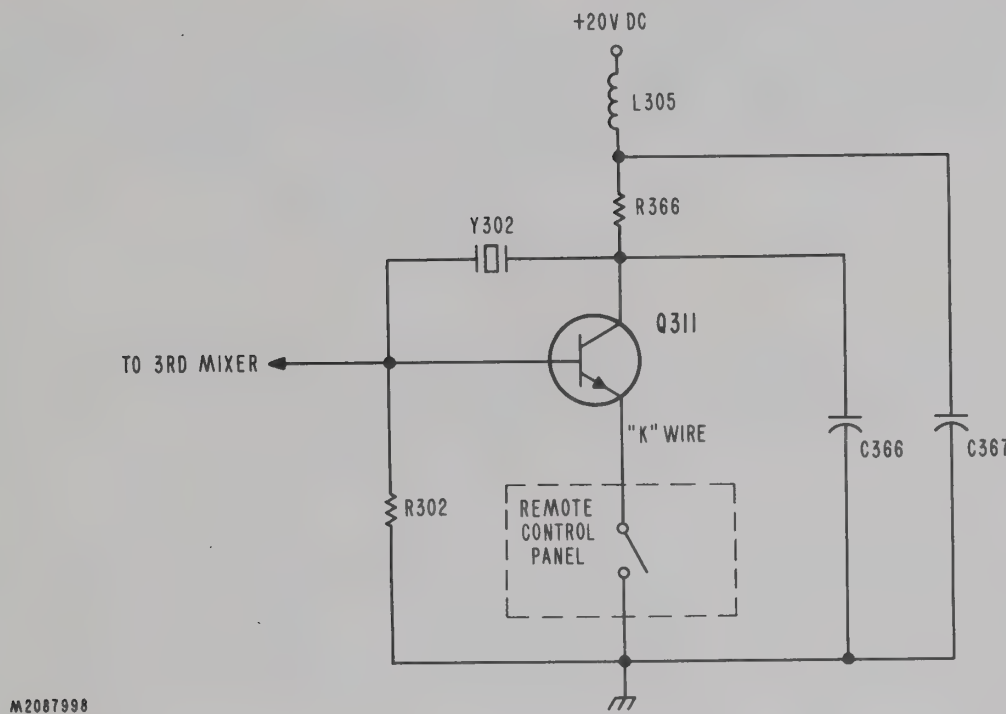

Figure 2-6. 3265-kc Portion of Third Oscillator, Simplified Schematic Diagram

G. I-F SECTION

The "if amplifiers" are seven transformer-coupled, grounded base amplifier stages. Since the over-all frequency response of the "if amplifiers" is very broad, the selectivity characteristics are primarily determined by filter FL301 at the output of the "3rd mixer" stage. The first and third "if amplifiers" (Q302 and Q304) are used as variable gain amplifiers with avc current drawn through the emitters. The avc and emitter current of Q302 is routed through filter FL301. With increasing signal levels, the gain of Q302 and Q304 is reduced by decreasing emitter current in these stages. Diodes CR301 and CR302 are inserted in the emitter circuits of Q302 and Q304 to insure that the avc current divides equally between both transistors.

H. AUDIO SECTION

1. Detector

Emitter follower Q309 is an infinite-impedance detector. A fixed bias of less than +2 volts is applied to the base of Q309 by the voltage divider consisting of resistors R351 and R346. The positive peaks of the i-f input signal drive the base positive and the emitter follows. The negative peaks drive Q309 into cutoff. The carrier frequency components are removed from the signal by a filter consisting of inductor L304 and capacitors C356, C357, and C358. This leaves a positive audio frequency modulation output riding on a positive d-c voltage that is proportional to the carrier level.

2. Navigation and ATCSS Output Stage

The audio envelope produced by "detector" Q309 is applied directly to the base of "nav and atcss output" stage Q401. This stage is connected as an emitter follower to provide a low impedance (less than 1000 ohms) audio output for navigation and ATCSS. The output frequency response is flat within ±2 db from 30 cps to 10 kc. The output of Q401 is also applied to the audio filter and noise limiter circuit.

3. Audio Filter

A portion of the output of Q401 is applied through resistors R433 and R434 to "audio filter" FL401. For all communication channels, a voltage divider is formed by resistors R433 and R431. This is accomplished by connecting one end of R431 to ground, through contacts of switch wafer S101C, which reduces the audio level to compensate for the higher modulation percentage on the communication channels.

The audio signal is narrowed to the voice communication frequency range by "audio filter" FL401 that produces an output that is flat within ±6 db from 350 cps to 2500 cps. The output is down at least 15 db at 150 cps and at least 30 db at 3000 cps, which prevents interference from beat frequencies that may be caused by carriers near the channel being monitored.

4. Noise Limiter

Diodes CR406 and CR407 operate as a noise limiter to block noise voltages that exceed 0.6 volt. The two diodes are normally forward biased by a positive supply voltage, which is applied to resistor R437. This voltage is supplied through the closed contacts of "2 mc stepper control relay" K101 and "0.1 mc stepper control relay" K103, while these relays are deenergized. However, when a frequency selection is being made, K101 and K103 are energized, disconnecting the forward bias voltage. In this case all audio signals are completely blocked by CR406 and CR407. After the frequency selection has been made, K101 and K103 are deenergized and the forward bias is again applied to R437, permitting noise limiter operation.

Figure 2-7 is a simplified schematic diagram of the noise limiter, and shows the normal bias currents in the noise limiter circuit by assuming conventional (positive) current. Due to the low current through each diode under quiescent conditions (approximately 40 microamperes) the forward resistance presented by each is quite high and 0.5 volt is developed across each diode. The voltage across series resistors R435 and R438 is approximately 0.1 volt. Over the small signal range applied to the noise limiter circuit (peak 0.03 volt), the diodes act as fixed resistors and pass the signals through unchanged. However, whenever a noise spike appears which exceeds +0.6 volt, diode CR406 is cut off and the noise spike is blocked. Similarly, when a noise spike exceeds -0.6 volt, diode CR407 is cut off and the noise spike is blocked.

5. Squelch Circuit

The audio signal produced by the noise limiter is normally passed through forward-biased squelch diode CR409 to audio amplifier stage Q408. When the received r-f signal level is very low, the audio is squelched by transistor Q407, which back-biases CR409.

2-2.H.5. (Cont'd)

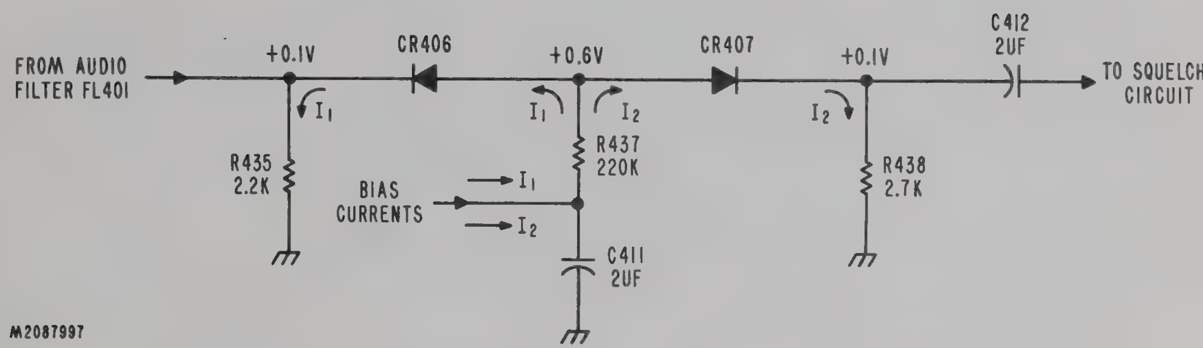

Figure 2-7. Noise Limiter, Simplified Schematic Diagram

The carrier level is monitored by the avc circuit which produces a positive bias voltage of about +12 volts at the base of Q407, whenever the carrier level is below a predetermined level, energizes Q407, and clamps the collector voltage of Q407 to the emitter voltage. This is approximately +10 volts, as determined by resistors R436, R443, and R442 (a +20-volt supply is applied to R436 via the contacts "2 mc stepper control relay" K101 and "0.1 mc stepper control relay" K103, as long as a frequency selection is not being made). Since a negligible current is flowing through resistor R446, the bias at both sides of diode CR409 is essentially the same and the diode represents an open circuit in the signal path, and since the signal level is very low, it is not sufficient to forward-bias CR409; thus the signal is squelched. When the carrier rises above a predetermined level, the avc bias supplied to the base of Q407 drops to a less positive value, and the collector voltage rises. The voltage at the collector of Q407 is now determined by a voltage divider consisting of resistors R436, R443, and R442. This voltage is +12.5 volts and is sufficient to forward-bias diode CR409. This diode now acts as a low resistance and passes the audio signal to audio amplifier Q408.

Normally, for communications channels, the avc bias voltage for squelch control is routed from test point TP12 in the avc circuits through the contacts of deenergized "comm-nav transistor" relay K105, "avc feedback (squelch)" switch S101C rear, "squelch disable" switch S401, resistor R444 and diode CR408 to the base of Q407. Switch S101C rear breaks the switching path for the navigation channels. When it is desired to extend the communications range down to 116.00 megacycles, relay K105 is energized by a ground applied to the "comm-nav transfer" input. The resulting contact closure in K105 bypasses S101C rear, thereby permitting the avc signal to be coupled to Q407. Squelch can be disabled by the "squelch disable" switch labled SQUELCH TEST, which is mounted on the front panel of the RA-22B. Whenever the associated VHF transmitter is keyed, a +27.5-volt "receiver disabling" input is applied to pin 23 of plug P1. This input is routed, via resistor R101, to diode CR408 to squelch the receiver audio during transmission. Diode CR408 prevents very strong avc voltages from reverse-biasing Q407.

6. Audio Amplifiers

The audio signals applied to the base of audio amplifier Q408 are amplified and routed through coupling capacitor C415 to "volume control" potentiometer R454. Thermistor RT401, in series with the Q408 collector load resistor (R458), compensates for the increase in transistor voltage gain accompanying an increase in temperature. The resistance of the thermistor drops with increasing temperature, providing a compensating loss in gain.

The audio signal derived from the arm of "volume control" potentiometer R454 is amplified by audio amplifier Q409; temperature compensation for this stage is provided by thermistor RT402. The signal at the collector of Q409 is applied to audio drivers Q410 and Q411. These stages are connected as successive emitter followers to provide a low impedance audio output. The audio output is nominally 100 milliwatts and, because of the low output impedance, is relatively unaffected by changes in external loading.

The audio output is applied to the AUDIO jack on the front panel of the RA-22B ("audio output" jack J1), and, in addition, is also applied to pin 4 of plug P1, for transmission to remote units.

I. AVC CIRCUITS

1. AVC Amplifiers

The carrier level d-c voltage produced by "detector" Q309 is applied to the base of transistor Q402, which is the first of three common emitter "avc amplifier" stages. Negative feedback for the a-c component of the audio is provided from the collector of the third stage, Q404, through capacitor C402 to the base of Q402. Thus, the output of Q404 follows the slow variations in carrier level, but does not respond to the audio components. The output of Q404 at any time is a d-c signal that represents the carrier level. This is the raw avc voltage.

Because of the inversion introduced by the three "avc amplifier" stages, the output becomes more positive for decreases in carrier level, and less positive for increases in carrier level. Due to the low audio frequencies (30 cps) that appear in the navigation channels, additional capacitance is required in the negative feedback path from Q404 to Q402 for these channels. This is provided by capacitor C401 which is connected across the feedback path by "avc feedback (squelch)" wafer switch S101C rear and the contacts of deenergized "comm-nav transfer relay" K105. Switch S101C is mounted on the shaft of "2 mc stepper" switch K102, and connects C401 on all navigation channels.

Zener diode CR401 maintains a constant voltage of +8 volts across "avc delay control" potentiometer R403 in the emitter circuit of Q402. This potentiometer applies a fixed bias to the emitter of Q402 so that no collector current flows until the carrier level drives the base above this value. The avc output produced by Q404 does not respond at all to weak signals but remains constant at a high positive value. The threshold level for avc control is determined by the setting of R403.

The avc voltage produced at the collector of Q404 is routed via resistors R414 and R422 to the grid bias circuits of the "rf amplifier" and "1st if amplifier" stages. This voltage goes less positive to provide reduced gain for increasing carrier levels.

The avc voltage at the collector of Q404 is also routed via contacts of "squelch disable" switch S401 to squelch circuit Q407 (refer to paragraph 2-2.H.5.).

In addition, the avc voltage at the collector of Q404 is routed through resistors R414 and R423 to the base of "avc amplifier" Q406. This stage regulates the emitter current for the first and third "if amplifiers" stages (Q302 and Q304). Figure 2-8 illustrates the path of this current. An increase in signal level results in a less positive voltage at the base of Q406. The resulting decrease in collector current of Q406 reduces the emitter current for Q302 and Q304 which flows via diodes CR301 and **CR302.**

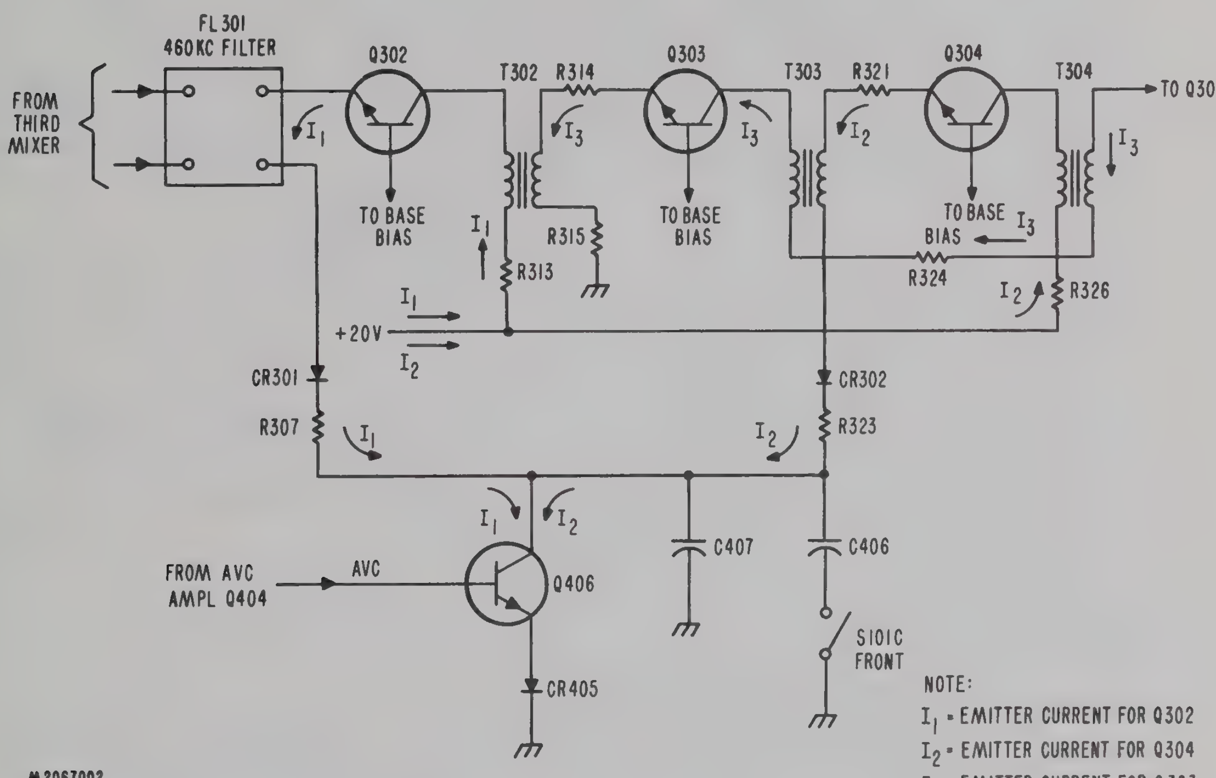

Figure 2-8. Flow of D-c Emitter Current in First Three I-f Amplifier Stages, Simplified Schematic Diagram

Diodes CR403, CR404 and CR405 act as non-linear resistors to adjust the level of avc to the i-f amplifiers. They also provide temperature compensation. Diodes CR301 and CR302 in the emitter current path to Q302 and Q304 make use of their non-linear forward resistance to ensure that the avc current is divided equally between both transistors. At high signals, when the avc emitter current is very small, the flow of emitter current to Q302 and Q304 is likely to be unbalanced because of variations in transistor characteristics. This tendency is compensated for by CR301 and CR302 which present a high resistance at low current levels. The resulting high impedance in series with Q302 and Q304 causes the circuit to be relatively insensitive to variations in the transistor characteristics. Capacitor C407 provides filtering to remove high-frequency noise from the avc current.

For the navigation channels where very low audio frequencies (30 cps) are used, additional capacitance is provided by C406, which is connected to ground via "audio gain switch avc filter" switch wafer S101C front, and the contacts of deenergized "comm-nav transfer relay" K105.

2. Sensitivity Control Stage

The signal level below which audio signals are squelched, is determined by "sensitivity control" stage Q405. Normally, the voltage divider formed by resistor R416 and "sensitivity control (squelch level)" potentiometer R415 applies a fixed bias to the base of Q405. This determines the collector voltage. The avc voltage at test point TP13 is normally more positive than that at the collector of Q405 for weak signals. Thus, diode CR402 is forward-biased for these signals and the avc voltage at TP13 is clamped to the collector of Q402. This is the squelch level. The avc voltage at TP13 does not change until the voltage produced by the collector of Q404 drops sufficiently to cut off diode CR402. The setting of the "sensitivity control (squelch level)" potentiometer, labeled SENS, may be adjusted on the front panel of the RA-22B.

A ground is applied to the base of Q405 via "sensitivity (squelch)" switch S101B rear and the normally closed contacts of deenergized "comm-nav transfer relay" K105 to ensure that squelch control is disabled for the navigation channels. The S101B rear contacts are closed and K105 is deenergized for all navigation channels. The ground to the base of Q405 cuts off this transistor, thereby back-biasing diode CR402 and disabling squelch. Squelch can also be remotely disabled by a ground at the "hi" side of the "remote squelch control" input at pin 25 of plug P1. This ground is applied directly to the base of Q405. In addition, remote variable squelch control can be obtained by connecting an external potentiometer between pin 25 of plug P1 and ground.

J. POWER SUPPLY CIRCUITS

1. Filter and Voltage Regulator in the RA-22B

The +27.5-volt input is applied to pin 2 of plug P1 and filtered by a filter consisting of L101, C105, C106, and C107. This suppresses high voltage transients that would otherwise damage the various transistors in the RA-22B. Diode CR105 suppresses the negative-going swing of high voltage transients and also protects against the application of d-c power of reversed polarity.

The filtered 27.5-volt power is passed through resistors R135 and R136 and series regulator ("filter") Q102 to provide the +20-volt transistor supply voltage for the RA-22B (see figure 2-9). "Filter amplifier" Q101 compares a 19.8-volt reference produced by Zener diode CR104 and CR106 with the +20-volt output. When the +20-volt output drops, the base-to-emitter forward bias is increased. The resulting rise in collector current flowing through thermistor RT101 and resistor R132 to the collector of Q101 causes a drop in the voltage at the base of Q102. The resulting drop in collector-to-emitter resistance in Q102 restores the +20-volt output to its correct value. Thermistor RT101 compensates for the increase in Q101 and Q102 collector currents accompanying an increase in temperature. Thus, an increase in temperature would tend to raise the voltage level of the +20-volt output. However, the accompanying drop in resistance of RT101 raises the voltage at the base of Q102, thereby increasing the Q102 collector-to-emitter resistance and reducing the output.

2-2.J.1. (Cont'd)

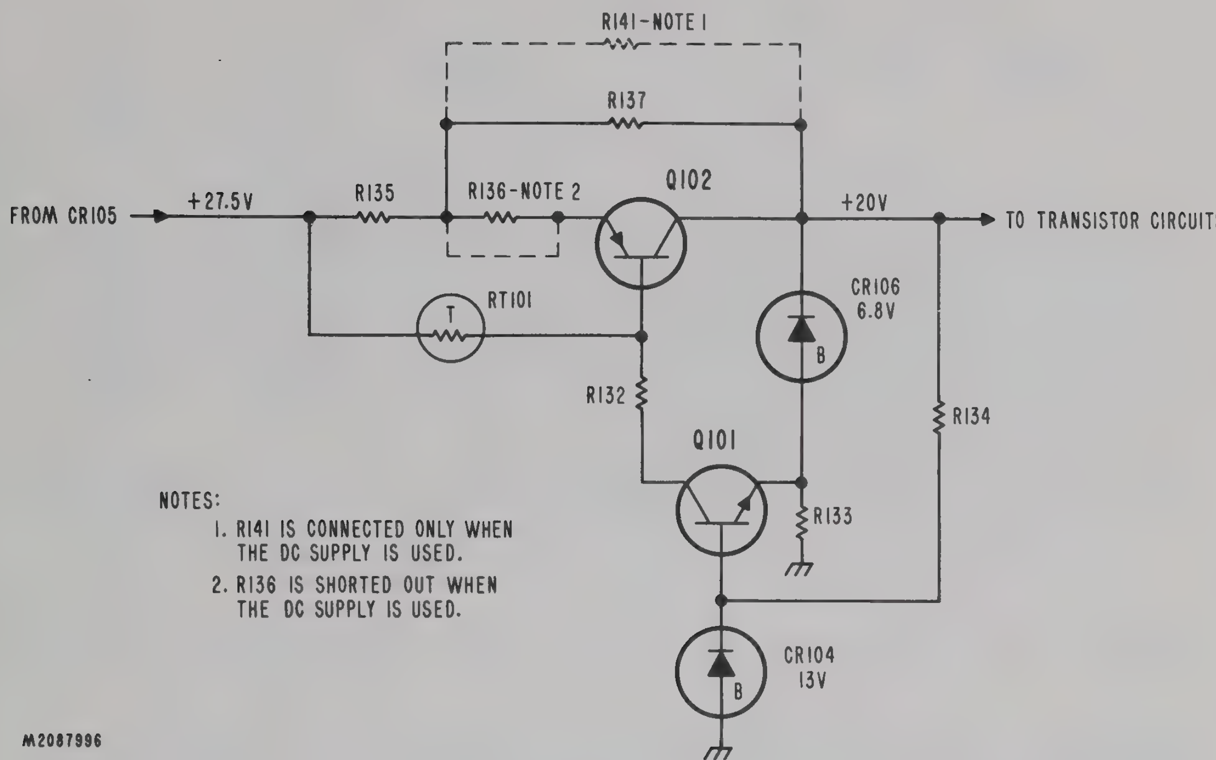

Figure 2-9. Voltage Regulator, Simplified Schematic Diagram

To satisfy the need for greater current when the d-c power supply is used, resistor R136 is replaced by a direct connection and R141 is connected in parallel with R137, as shown in figure 2-9. These changes form part of the power supply plug wiring and are accomplished automatically when changing supplies.

2. PSA-21A Power Supply

The PSA-21A Power Supply (figure 6-2) operates from a 115-volt, 300- to 1000-cps primary voltage. This a-c power supply provides the RA-22B with +130 volts dc for B+ power and 6.3 volts ac for filament power.

The 115-vac input voltage is applied directly to a step-down transformer, T101, and through a high-frequency line filter, L102, R101, C101, to half-wave rectifier CR101. The +130-vdc output from the rectifier is filtered by C102 and L101 in the power supply, and by C103A, C103B, and R131 in the RA-22B. The step-down transformer provides 6.3-vac filament voltage for the receiver. As shown in figure 2-10, pins H and L of J1 in the RA-22B are grounded by a jumper in the power supply, and 6.3 vac is applied to pins F and K. Thus the tube filaments are connected in parallel.

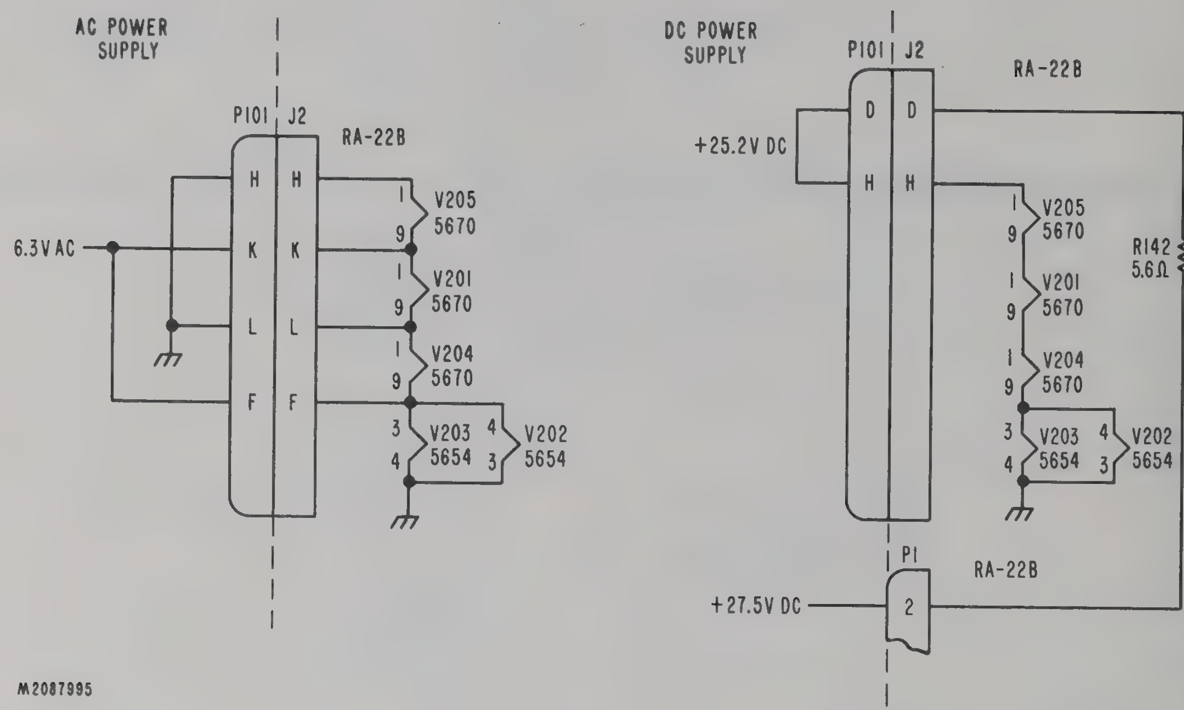

Figure 2-10. Filament Connections

3. PSA-21B, PSA-21B-1, and PSA-21B-2 Power Supplies

The d-c power supplies (figures 6-3, 6-4, and 6-5) are electrically identical. Each operates from +20-volt input power supplied by the voltage regulator in the RA-22B. The d-c power supply provides the RA-22B with +130 volts dc for B+ power and includes a jumper connection to route +25.2 volts dc to the filament circuits. The +20-volt input power is coupled through a filter network, consisting of capacitors C101 and C102, and inductor C101, to a free-running multivibrator which consists of transistors, Q101 and Q102 together with saturable-core transformer T101. The bases of the transistors are biased slightly negative, with respect to the emitters, by the voltage divider consisting of resistors R102 and R103, and thermistor RT101 which compensates for temperature variations. The transistors act as switches, alternately interrupting the +20-volt input.

The 2050-cps square-wave output of the multivibrator is stepped up by the transformer secondary and applied to a full-wave rectifier consisting of two silicon diodes, CR101 and CR102. The rectifier provides +130 vdc operating voltage to the RA-22B.

Heavy filtering is provided in the input and output of the power supply to confine the 2050 cps and its harmonics within the unit. It is normal for the power supply to radiate a weak, high-pitched sound at its operating frequency. The input filter is composed of C102, C101, and L101. The output filter is composed of R104, C103, L102, and C104 in the power supply, and C103A, C103B, and R131 in the receiver. A jumper across the connector pins arranges the filaments of the RA-22B tubes in series, as shown in figure 2-10.

2-3. OPTIONS

A. 4RAX-21/22 SUPER SQUELCH

There is now available a Super Squelch Option (4RAX-21/22) for the RA-22B VHF Receiver. The 4RAX-21/22 Super Squelch employs a unique, Bendix developed, squelch-derivation system wherein a very narrow squelch bandpass is made possible by converting all frequencies in the receiver's pass band (460 ±20kc) to a single frequency (636-kc) by multiple mixing. In this type squelch system, random noise tends to cancel, leaving only the carrier in a narrow band amplifier. A second frequency of 634-kc is mixed with the 636-kc carrier to yield a 2-kc signal whose amplitude is representative of signal strength. This signal, after rectification, is applied to a switch circuit which unsquelches the receiver. Unless this 2-kc signal is applied to the switch circuit, the receiver will be squelched.

The optional 4RAX-21/22 Super Squelch can be obtained as a factory installed unit in the RA-22B VHF Receiver, or it can be obtained as a kit (Bendix Part Number, 2065051-0001; installation instructions, 2072937-0001) for retrofit installation in the field.

When the 4RAX-21/22 is incorporated in the receiver, the receiver squelch can still be remotely controlled.

Figure 2-11 is a simplified block diagram of the 4RAX-21/22 Super Squelch and the following discussion refers to the block diagram.

The i-f output signal (1) from the receiver is coupled to the first mixer (2) and to the second mixer (4) in the 4RAX-21/22. Heterodyning with the 636-kc first oscillator frequency, the i-f carrier frequency (which maybe located anywhere in the range from 440kc to 480kc) produces a difference frequency between 196kc and 156kc. It should be noted that the difference between incoming i-f (1) and the first oscillator (3) frequencies is the output of the first mixer (2); and since the first oscillator is higher in frequency than the i-f input, the first mixer will have an inverted output spectrum. More simply when the i-f input is lowest in frequency (440-kc), the output frequency of the first mixer will be highest (196-kc) and vice-versa. Subjecting this inverted difference frequency to heterodyning, in the second mixer (4), with the original i-f input frequency, produces an output frequency of 636-kc regardless of the frequency of the applied i-f input.

The 636-kc output of the second mixer (4) is combined with the 634-kc output of the second oscillator (6) in the third mixer (5) producing a 2-kc beat note whenever a carrier is present. This 2-kc signal is filtered (all frequencies except the 2-kc beat-note removed) and rectified (7). The resulting d-c voltage (8) amplitude (representative of carrier strength) is amplified and applied to the receivers squelch transistor (Q407 in the RA-22B) which acts as a switch.

The switch (Q407) in its quiescent (no signal)state produces a current which, when applied to the receiver's audio section, biases the audio amplifier to cut-off. When the rectified 2-kc, from the filter-rectifier (8) reaches the triggering level of the switch, it turns the switch off, thus unsquelching the receiver. Regenerative feedback in the switch circuit ensures the positive switching at this level.

A schematic diagram of the 4RAX-21/22 Super Squelch can be found in the back of the book, Figure 6-5, Page 6-11.

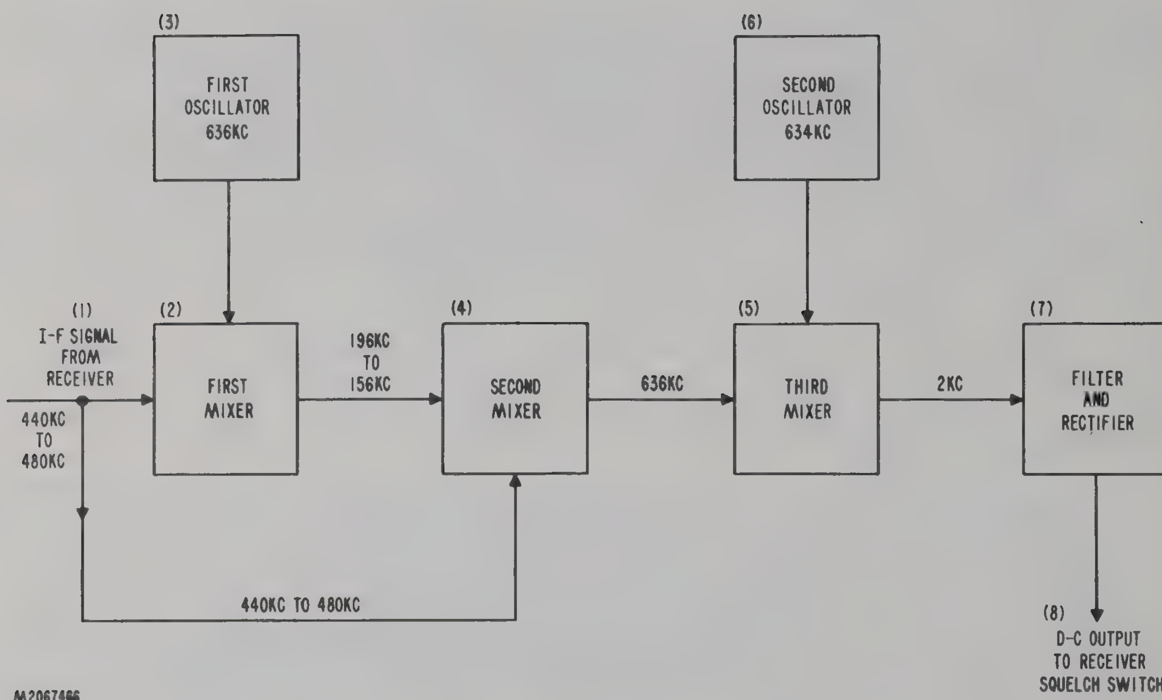

Figure 2-11. 4RAX-21/22 Super Squelch, Block Diagram.

SECTION III. ADJUSTMENT AND TEST PROCEDURE

3-1. LIST OF TEST EQUIPMENT RECOMMENDED

Test equipment recommended for performing the operational tests and adjustments is listed in table 3-1. The table provides test equipment characteristics for all items, except the Bendix RAT-22A VHF Receiver Test Set, so that equivalent available equipment can be used. The number appearing in the "ITEM" column for each piece of test equipment is used throughout the text to identify the equipment. The items are presented in the table in the order in which they appear in the text.

TABLE 3-1.

RECOMMENDED TEST EQUIPMENT

ITEM	DESCRIPTION	SPECIAL TYPE OR CHARACTERISTIC REQUIRED	REPRESENTATIVE TYPE
1	VHF Receiver Test Set	Bendix Avionics model RAT-22A modified to include CNA-22( ) Control.	-
2	Vacuum Tube Voltmeter (vtvm)	Used for measuring a-c voltages between 1 vac and 115 vac, and d-c voltages between 10 vdc and 140 vdc.	Hewlett-Packard 410B
3	Wattmeter	Used for measuring power in milliwatts between 70 mw and 120 mw, using 500-ohm load.	General Radio 583A
4	Signal Generator	Provides required frequencies between 108.00 mc and 140.00 mc at voltages between 3 μv and 200 mv at 30 and 50 per cent modulation.	Boonton 211-A
5	Audio Oscillator	Provides audio signals to signal generator (4) in range from 30 cps to 10 kc.	Hewlett-Packard 200AB
6	A-c Vacuum Tube Voltmeter (a-c vtvm)	Used for measuring a-c voltages between 0.5 vac and 1.0 vac. Also contains db scale for values between 1 db and 35 db.	Ballantine 310B
7	Earphones	Plug into RA-22B AUDIO jack and RAT-22A PHONES jack.	-
8	Signal Generator	Similar to signal generator (4) but provides frequencies up to 151.95 mc.	Hewlett-Packard 608D
9	I-f Input Probe*	Schematic, figure 3-6	-
10	Frequency Counter*	Measures frequencies between 18.000000 and 136.000000 mc.	Hewlett-Packard 524B with 525B and 525A converters

* Items used in section IV only.

TABLE 3-1. (Cont'd)

RECOMMENDED TEST EQUIPMENT

ITEM	DESCRIPTION	SPECIAL TYPE OR CHARACTERISTIC REQUIRED	REPRESENTATIVE TYPE
11	I-f Detector Probe*	Schematic, figure 3-6	
12	Sweep Generator*	Provides swept r-f frequencies from 3 mc to 152 mc. Uses i-f crystal markers at 3.7 mc, 3.8 mc, 15.00 mc, 15.15 mc, 16.80mc, and 16.95 mc, and r-f crystal markers at 109.00, 110.00, 111.00, 111.95, 130.00, 130.95, 151.00, 152.00mc.	Telonics SM2000 LB-2-3M head (I.F.) L-7M head (R.F.)
13	Oscilloscope*	Displays required waveforms in vertical sensitivity range between 2 mv/cm and 0.5 volt/cm and horizontal sensitivity between 0.5 and 1 volt/cm. Also contains vertical and horizontal calibrate controls.	HP 130
14	R-f Detector Probe*	Schematic, figure 3-6	
15	Multimeter*	Used for general voltage and resistance measurements.	Triplett 630
16	6 db pad	Reduces signal 6 decibels	Boonton 505B
17	Signal Generator*	Provides crystal controlled signals at frequencies of 3.689, 3.705, 3.725, 3.739, 3.745, 3.755, 3.795, and 3.811 mc.	HP606
18	Attenuator	50 ohm 9 step 101 db coverage	Kay Model 30-0

* Items required for Section IV Procedures only.

3-2. RAT-22A VHF RECEIVER TEST SET

A. DESCRIPTION

The Bendix Type RAT-22A VHF Receiver Test Set is used to test and adjust the RA-22B VHF Receiver. This test set is designed for standard rack mounting or for use on bench top.

The operating power required is 27.5 volts dc and, when the receiver under test contains an a-c power supply, 115 volts 400 cycles. The test set contains all the necessary interconnections between the unit and the power and signal sources. The receiver and primary power connectors, and a terminal board for use with an external B+ voltage source are located at the rear of the test set chassis. Figure 3-7 shows the RAT-22A front panel controls and indicators. Plug-in type automatic Frequency Selector Panel CNA-22-YSV-1 provides remote control of the frequency of the RA-22B during the test and adjustment procedures.

B. CALIBRATION

The RAT-22A VHF Receiver Test Set is calibrated and adjusted at the factory. If recalibration and adjustment become necessary after a period of use, the following procedure is required for recalibration.

(1) Connect test set (1) to RA-22B and, with 27.5 VDC POWER and 115 VAC 400~ POWER switches on test set (1) turned off, connect primary power.

(2) Connect one lead of vtvm (2) to lug number 3 of 115 VAC 400~ POWER switch (terminus of white-blue wire), and connect the other lead to the axial lead of fuse holder (a-c line fuse). Adjust power source for 115 vac.

(3) Connect positive lead vtvm (2) to lug number 6 of 27.5 VDC POWER switch (terminus of white-orange wire) and connect the negative lead to chassis ground. Adjust power source for 27.5 vdc.

(4) Apply power to test set (1) by placing power switches in up position and allow the unit to warm up for at least 3 minutes.

(5) Recheck meters for 115 vac and 27.5 vdc readings; adjust voltages if necessary.

(6) Set the test set (1) meter selector switch to 115 VAC 400~ position and adjust A-C CAL control so that the panel meter reads on red line.

(7) Set meter selector switch to 27.5 VDC and adjust the D-C CAL d-c calibration control so that meter M1 reads on red line.

(8) Set INTERNAL-EXTERNAL switch to EXTERNAL and apply sufficient input signal to RA-22B to produce a 100 mw on wattmeter (3). (Set wattmeter for 500-ohm load.)

(9) Set INTERNAL-EXTERNAL switch to INTERNAL and adjust audio calibration control R4 so that meter reads on red line.

C. PREPARATION FOR USE

Connect test set (1) to the RA-22B; perform the following initial RAT-22A switch settings, and allow at least 3 minutes for equipment to warm up. For the alignment procedures of paragraph 3-3 allow 15 minutes warm-up.

Switch	Setting
NORMAL/COMM-NAV	NORMAL
INTERNAL-EXTERNAL	INTERNAL
115 VAC 400~ POWER	On (up)
27.5 VDC POWER	On (up)
RECEIVER DISABLE	Off (down)

NOTE

The red, yellow and blue markings on the VOLTMETER face indicate tolerance limits of 5, 10, and 20 percent, respectively.

3-3. ALIGNMENT AND ADJUSTMENT PROCEDURES

The RA-22B VHF Receiver is shipped from the factory with all sections correctly aligned, and normally further adjustment is not required prior to installation. Adjustment information is furnished in this section in order that the user can keep the unit properly adjusted for maximum efficiency.

A. ALIGNMENT

Before performing the alignment procedures connect equipment as shown in figure 3-1, which contains the basic setup for all of the alignment procedures. When the alignment procedures have been completed, perform the troubleshooting tests in paragraph 4-4.C., in the sequence given, to check that the receiver has been properly aligned. See figures 4-2 and 4-3 for location of adjustments used during alignment.

1. Second I-f Stage

NOTE

If the RA-22B Receiver being tested contains a 4RAX-21/22 Super Squelch, perform the following procedure prior to aligning receiver. Remove transistor Q4 and rotate the squelch adjust potentiometer fully clockwise.

(1) Connect i-f detector probe (11) to MARKER ADDER IN terminal of sweep generator (12) and place probe on terminal 1 (lower) of inductor L225.

WARNING

130 volts dc is present at T1 of inductor L225.

(2) Connect i-f input probe (9) to sweep generator RF OUTPUT terminal and place probe on TP3.

(3) Adjust vertical sensitivity on oscilloscope (13) for 0.2 mv/cm and horizontal sensitivity for 1 volt/cm.

(4) Install i-f head (LB-2-3M) in sweep generator (12) and adjust generator for approximately 23 db attenuation.

(5) Connect jumper between terminal 1 of inductor L301 and ground.

(6) Tune inductor L225 (right side) for maximum output with center frequency at 3.775 mc as shown in A of figure 3-2.

(7) Remove jumper connected in step (5) and connect jumper between terminal 1 of inductor L302 and ground.

(8) Tune inductor L301 for valley center at 3.755 mc, as shown in B of figure 3-2.

(9) Remove jumper connected in step (7) and connect jumper between terminal 1 of inductor L303 and ground.

(10) Tune inductor L302 for maximum response at 3.755 mc shown in C of figure 302.

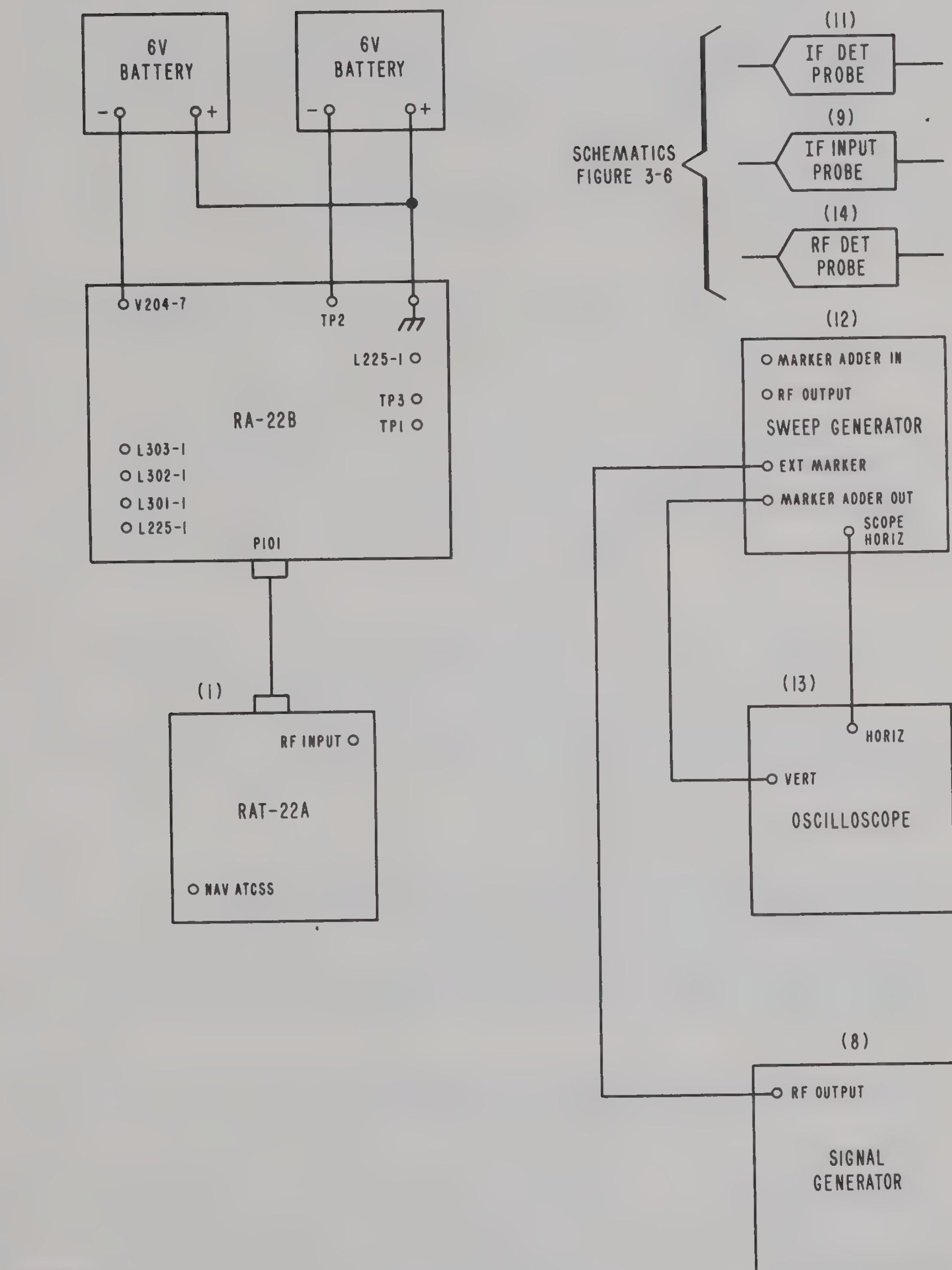

Figure 3-1. Basic Alignment Procedure Test Setup

3-3.A.1. (Cont'd)

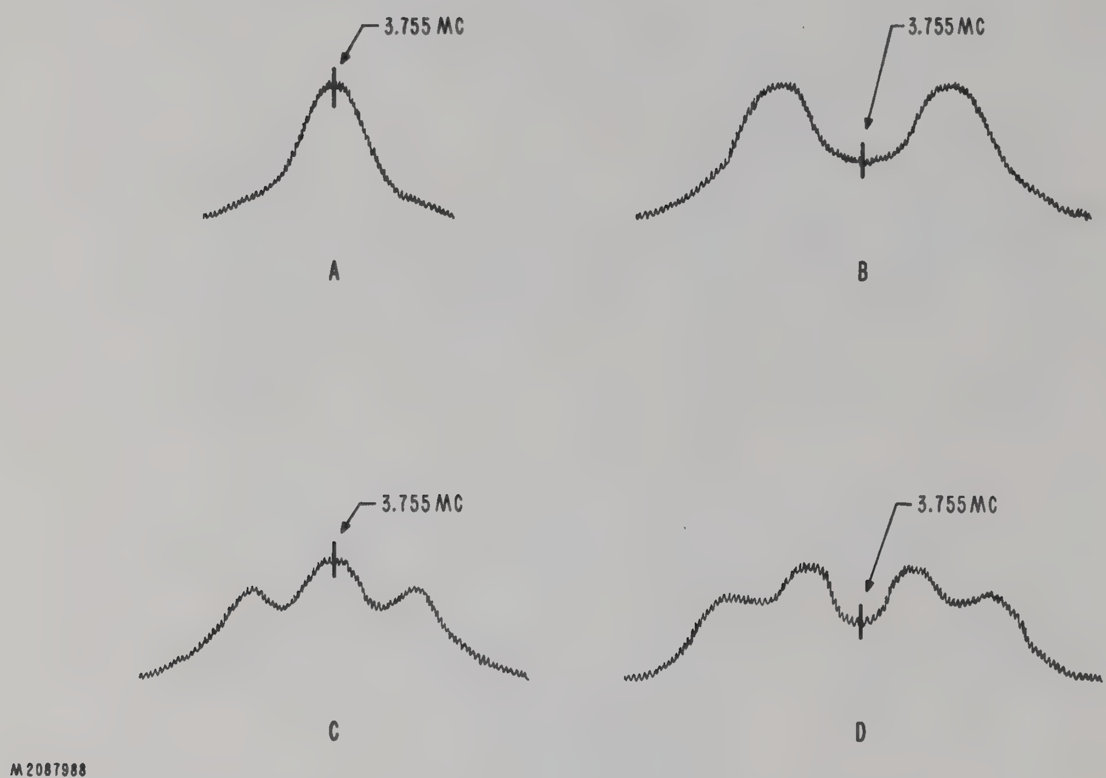

Figure 3-2. Typical I-f Alignment Response Curves

(11) Remove jumper connected in step (9).

(12) Tune inductor L303 for response shown in D of figure 3-2.

(13) Remove i-f detector probe (11) from terminal 1 of inductor L225.

(14) Connect cable between test set NAV ATCSS terminal and sweep generator MARKER ADDER IN terminal.

(15) Adjust test set FREQUENCY SELECTOR for 114.90 mc.

(16) Adjust oscilloscope vertical gain for 0.5 volt/cm and adjust sweep generator (12) for 40 to 50 db attenuation.

(17) Remove avc transistor amplifier Q406. Turn avc delay control R403 and SENS control R415 (figure 1-2) fully clockwise.

(18) Repeat step (6).

3-3.A.1. (Cont'd)

(19) Adjust FREQUENCY SELECTOR for 114.95 and observe symmetrical response curve on oscilloscope (13). Readjust inductor L225, if necessary. Lock R403.

2. Third I-f Stage

(1) Adjust FREQUENCY SELECTOR for 114.90 mc and signal generator (8) for 3.775 mc.

(2) Adjust input and output trimmers of 460 kc filter FL301 for proper symmetry on oscilloscope.

(3) Replace avc transistor amplifier Q406 and lock filter input and output trimmers.

3. First Oscillator

(1) Connect vtvm (2) for negative d-c measurement, to TP2.

(2) Adjust FREQUENCY SELECTOR for 115.00 mc.

(3) Using phenolic tuning tool, tune capacitor C264 for peak negative voltage on vtvm (2). (Tuning capacitor C264 adjustment should not be turned fully to either limit.)

(4) Adjust FREQUENCY SELECTOR for 148.00 mc.

(5) Adjust inductor L209 for peak negative voltage on vtvm (2). Repeat step (3) and (5) until one adjustment no longer affects the other.

(6) Adjust FREQUENCY SELECTOR successively for 108.00 mc, 124.00 mc, 130.00 mc, 136.00 mc, and 151.00 mc and at each of these frequencies observe and record aligned d-c voltage on vtvm (2).

(7) Adjust FREQUENCY SELECTOR successively for the frequencies designated in step (6) and adjust tuning capacitor C264 for peak d-c voltage on vtvm (2). Observe and record values obtained at each of the designated frequencies. The readings obtained in step (6) must be at least 85 per cent of the values obtained in this step. Realign first oscillator, if necessary.

4. Doubler

(1) Connect vtvm (2), for a-c measurements, to TP1.

(2) Adjust FREQUENCY SELECTOR for 115.00 mc.

(3) Tune capacitor C272 for peak a-c voltage.

(4) Adjust FREQUENCY SELECTOR for 148.00 mc.

(5) Tune inductor L211 for peak a-c voltage.

(6) Retune capacitor C272 and inductor L211 for peak a-c voltages, as necessary.

5. First I-f Stage

(1) Connect r-f detector probe (14) to sweep generator MARKER ADDER IN terminal and place probe on TP3.

(2) Connect i-f probe (9) to sweep generator RF OUTPUT terminal and place probe on TP1.

(3) Adjust sweep generator (12) for 10 db attenuation.

(4) Adjust oscilloscope vertical sensitivity for 10 mv/cm and horizontal sensitivity for 0.5 volt/cm. Set both vertical and horizontal verniers to calibrate position.

(5) Turn avc delay control R403 fully clockwise.

(6) Turn SENS control R425 (figure 2-1) fully clockwise.

(7) Remove third mixer transistor Q301.

(8) Adjust FREQUENCY SELECTOR for 108.00 mc.

(9) Tune inductors L221, L222, L223, and L224 to obtain maximum symmetrical output at 15.075 mc.

(10) Adjust sweep generator (12) for 15.075 mc, using markers at 15.000 mc and 15.150 mc as shown in A of figure 3-3.

(11) Adjust FREQUENCY SELECTOR for 109.80 mc.

(12) Adjust sweep generator (12) for 16.875 mc and turn on markers.

(13) Readjust components tuned in step (9) as necessary.

NOTE

There may be as much as 3 db (10 mv = 1 cm) difference between 108.00 mc and 109.80 mc.

(14) Remove all battery leads.

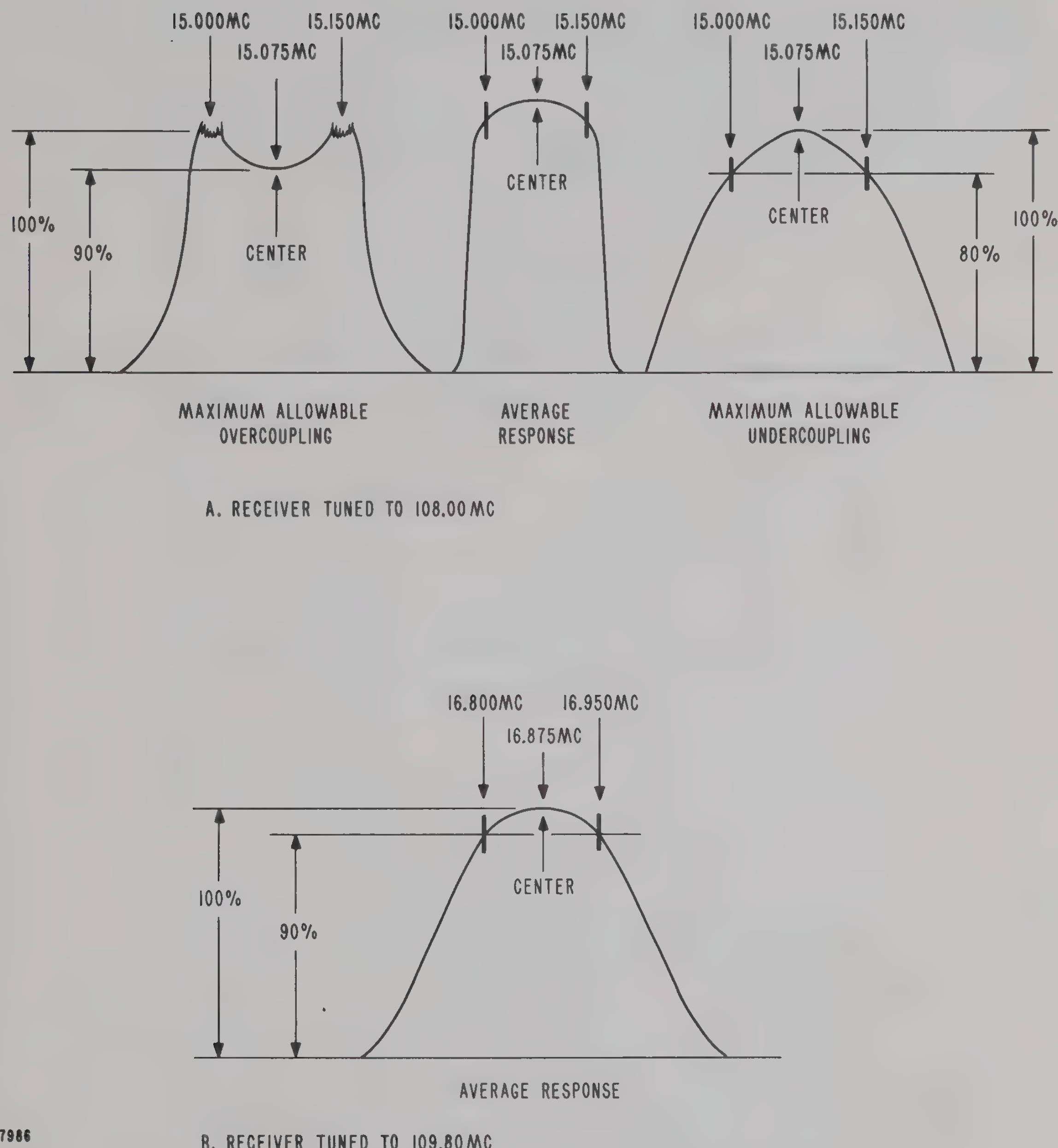

Figure 3-3. Typical First I-f Alignment Response Curves

6. R-f Amplifier

(1) Connect cable between sweep generator RF OUTPUT terminal and test set RF INPUT terminal.

(2) Connect r-f detector probe (14) to sweep generator MARKER ADDER IN terminal and place probe on TP1.

(3) Install r-f head (L-7M) in sweep generator (12) and adjust generator for approx. 20 db attenuation.

3-3.A.6. (Cont'd)

(4) Adjust oscilloscope horizontal sensitivity for 2 volts/cm and vertical sensitivity for 2 mv/cm.

(5) Connect 6-volt battery between TP2 (-) and ground (+).

(6) Adjust both FREQUENCY SELECTOR and sweep generator (12) for 109.50 mc using markers at 109.00 mc and 110.00.

(7) Adjust tuning capacitors C203, C205, C223, and C225 for maximum symmetrical output as shown in A of figure 304.

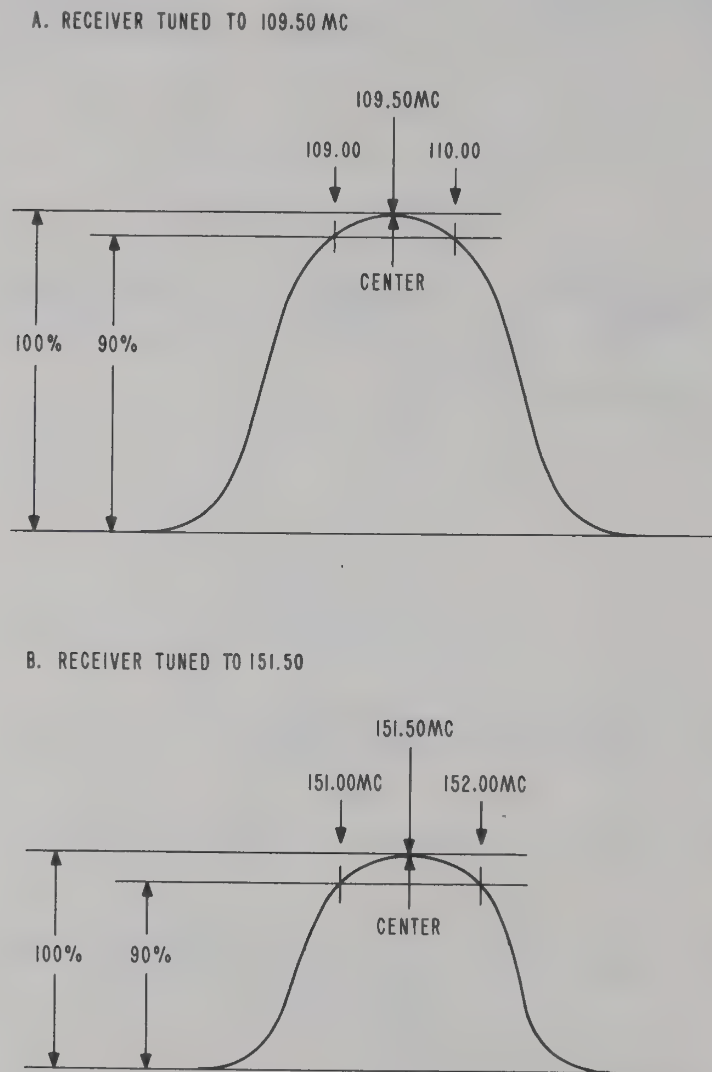

Figure 3-4. Typical R-f Alignment Response Curves

(8) Adjust both FREQUENCY SELECTOR and sweep generator (12) for 151.50 mc, using markers at 151.00 mc and 152.00 mc.

(9) Tune inductors L201, L203, L205, and L207 for maximum symmetrical output as shown in B of figure 3-4.

(10) Readjust components tuned in steps (7) and (9) as necessary.

NOTE: There may be as much as 6 db (10 mv = 1 cm) difference between 109.50 and 151.50.

(11) Replace third mixer transistor Q301 (removed in first i-f stage alignment).

(12) Remove battery leads.

(13) Replace transistor Q4 (removed in second i-f stage alignment).

7. 4RAX21/22 SUPER SQUELCH

(1) Disable normal receiver squelch by removing transistor Q407, and connect equipment as shown in figure 3-5 using 6 db pad (16) only.

(2) Adjust receiver and signal generator (4) to 114.90 mc; set signal generator (4) for 1000 μv output modulated 30% at 30 cps.

(3) Turn power on and adjust avc delay control R403 for 0.5 vac output. Lock R403.

(4) Adjust receiver and signal generator (4) to 118.90 mc and rotate SENS control R415 fully clockwise.

(5) Connect signal generator (4) through 6 db pad (16) and attenuator (18) to the RF input of RAT-22A Test Set.

(6) Set attenuator (18) for an attenuation of 20 db.

(7) Rotate the squelch adjust potentiometer R14, on right side of super squelch, fully clockwise and connect DC probe of vtvm (2) to TP1 of super squelch.

(8) Adjust L4 and L5 on super squelch sub-assembly for minimum reading on vtvm (2).

(9) Set output of signal generator (4) to 10 microvolts c-w, and adjust for minimum reading on vtvm (2).

(10) Rotate squelch adjust potentiometer R14 counterclockwise and verify that it is possible to squelch receiver output.

(11) Rotate squelch adjust potentiometer R14 until the receiver just mutes.

(12) Adjust signal generator (4) to 30 μv output modulated 90% at 1000 cps and connect DC probe of vtvm (2) to TP1 of super squelch.

(13) Switch modulation off then on; no increase in voltage should be observed.

NOTE: If an increase in voltage is noted, adjust R19 on super squelch to minimize the voltage increase.

(14) Repeat steps (9) thru (11).

(15) Reduce signal generator (4) output to zero microvolts and note vtvm (2) reading.

(16) Increase signal generator (4) output to 0.2 volt and note vtvm (2) reading.

NOTE: Voltage difference indicated in steps (15) and (16) should be at least 0.75 vdc.

(17) Adjust signal generator (4) for 50 mv modulated 100% at 1000 cps, and note that the receiver remains unsquelched while slowly varying the signal generator (4) frequency 15 kc above and below that of the receiver signal frequency (118.90 mc).

(18) Adjust signal generator (4) approximately 40 kc below the receiver signal frequency (118.90 mc).

(19) Slowly increase the signal generator (4) frequency and note the frequency at which the receiver unsquelches. (See NOTE below item 21).

(20) Adjust signal generator (4) approximately 40 kc above the receiver signal frequency (118.90 mc).

(21) Slowly decrease signal generator (4) frequency and note the frequency at which the receiver unsquelches.

NOTE: Check signal generator (4) output frequency at which the receiver unsquelched with frequency counter (10). Verify that receiver remains unsquelched over a bandwidth of not less than 15 kc above and below that of the receiver frequency.

(22) Replace transistor Q407.

(23) Rotate COMM/NORM switch on CNA-22( ) control to NORM.

(24) Turn signal generator (4) off. Receiver should be unsquelched on all NAV channels (108.00 mc thru 117.95 mc) and squelched on all COMM channels (118.00 and above).

B. ADJUSTMENTS

1. Volume Level

NOTE

The volume level is preset for a 1000 cps, 30 percent modulation, 100 mw audio output with the RA-22B from frequency set to 114.90 mc. The volume level, however, is adjustable to any desired level from 0 to 100 mw.

(1) Connect equipment according to the setup shown in figure 3-5.

(2) Connect wattmeter (3) to WATTMETER connector on test set (1).

(3) Adjust test set FREQUENCY SELECTOR for 114.9 mc.

(4) Adjust signal generator (4) for 114.90 mc, 1000 μv, 30 percent modulation at 1000 cps.

(5) Set meter selector switch on test set (1) to AUDIO POWER OUTPUT.

(6) Adjust RA-22B volume control R454 (figure 4-3) for 100 mw output level and lock R454 at this level.

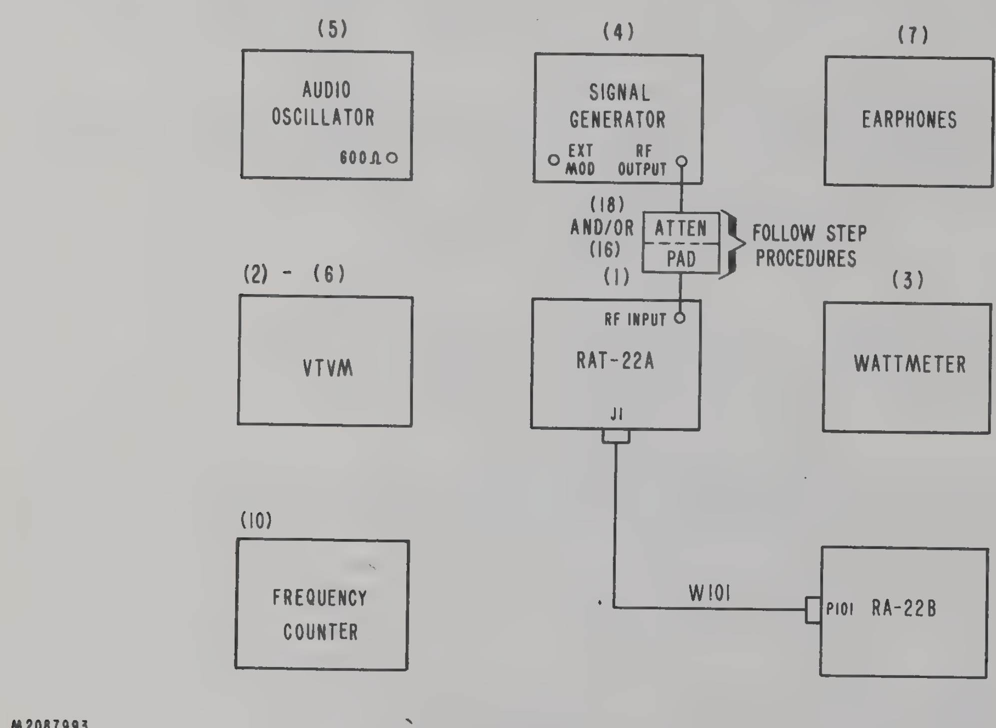

Figure 3-5. Adjustment and Bench Setup.

2. Squelch Level

NOTE

The squelch level is preset to unsquelch at 5 μv input with no external squelch control connected, and the receiver frequency set to 118.90 mc. The squelch level may, however, be set to any desired level from 2 to 25 μv to satisfy the customer's requirements.

(1) Connect equipment according to the setup shown in figure 3-5.

(2) Connect a-c vtvm (6) to test set NAV-ATCSS connector.

(3) Adjust test set FREQUENCY SELECTOR for 118.90 mc.

(4) Adjust signal generator (4) for 118.90 mc, 5 μv at 30 percent modulation, at 1000 cps.

(5) Turn REMOTE SQUELCH CONTROL on test set (1) fully counterclockwise.

(6) Adjust SENS control R415 (figure 1-2) until receiver unsquelches at desired squelch level.

3-4. RECEIVER TESTS

The receiver tests are performed to check the capability of the RA-22B under normal operating conditions. The adjustable internal controls of the receiver are illustrated in figures 4-3 and 4-4. Specific troubleshooting instructions are included with each test to help locate the source of trouble in case of test failure. In addition, general troubleshooting techniques for RA-22B are outlined in paragraph 4-4.

A. STEPPING SWITCH TEST

The stepping switch test checks the ability of the two-megacycle and tenth-megacycle steppers to home within a specified time. If either switch does not stop at the correct position, perform continuity checks using figures 4-18 and 4-19. If the timing is too slow, the switch may need lubrication; if so, refer to paragraph 4-3. Trouble may also be due to misalignment of the switch wafers on the shaft and/or a misalignment of the shaft coupling.

(1) Connect test set (1) to RA-22B.

(2) Switch the test set FREQUENCY SELECTOR through operating range in two-megacycle steps from 151.00 to 108.00 mc. Check that the dial on top of RA-22B indicates proper position at each step, and also that the stepping switch takes no longer than four seconds for a complete rotation. (The two-megacycle switch will make one complete rotation for each selection, since it can step only in forward direction.)

(3) Switch FREQUENCY SELECTOR through any whole megacycle range in 100 kc steps from 0.90 to 0.00 mc (0.80, 0.70, 0.60, etc). Check that the dial on right-hand side of RA-22B indicates the correct position at each step and that the time the stepping switch takes to complete one rotation for each step does not exceed four seconds.

B. FUNCTION SWITCH TEST

The function switch test checks the ability of the NORMAL/COMM-NAV switch on test set FREQUENCY SELECTOR to extend the communications range of the receiver to 116 mc. If the receiver fails to switch properly, check the comm-nav circuits for continuity using the schematic diagram in figure 6-1.

(1) Connect test set (1) to RA-22B.

(2) Adjust test set FREQUENCY SELECTOR to all 100 kc steps between 108 and 111 mc and check that ILS lamp on test set lights only on odd kilocycle increments (108.1, 108.3, 108.5 mc, etc).

(3) With NORMAL/COMM-NAV switch on test set (1) turned to NORMAL, check that COMM-NAV lamp does not light on whole megacycle frequencies between 108.00 and 117.95 mc; lamp should light on whole megacycle frequencies between 118 and 151 mc.

(4) Set NORMAL/COMM-NAV switch to COMM-NAV and check that COMM-NAV lamp lights on all whole megacycle frequencies between 116 and 151 mc.

C. AVC TEST

The avc test is performed to check the gain of the receiver under varying input conditions. If the values prescribed in this test cannot be obtained, perform the avc test in paragraph 4-4.C.2 to localize the source of trouble.

(1) Connect equipment as shown in figure 3-5. Connect audio oscillator (5) to signal generator (4).

(2) Adjust test set FREQUENCY SELECTOR for 114.90 mc.

(3) Connect a-c vtvm (6) to test set NAV ATCSS terminal.

(4) Set audio oscillator (5) for 30 cps.

(5) Adjust signal generator (4) for 114.90 mc, 1000 μv, 30 per cent modulation.

(6) Adjust avc delay potentiometer R403 for 0.5 volt ac on a-c vtvm (6) and lock R403.

(7) Adjust signal generator output for 5 μv, 100 μv, 1 mv, 50 mv, and 100 mv levels in sequence. Record db reading at each voltage level. The difference between the minimum and maximum db readings should not exceed 1.5 db.

D. AUDIO LEVEL TEST

The audio level test checks that the receiver can maintain the required output power level. If this power value cannot be obtained, perform the troubleshooting tests outlined in paragraph 4-4.C. to aid in localizing the source of trouble.

(1) Connect equipment as shown in figure 3-5. Audio oscillator (5) should be disconnected.

(2) Connect wattmeter (3) to WATTMETER connector on test set (1) and set INTERNAL-EXTERNAL switch on test set (1) to EXTERNAL.

(3) Adjust test set FREQUENCY SELECTOR for 114.90 mc.

(4) Adjust signal generator (4) for 114.90 mc, 1000 μv, 30 per cent modulation at 1000 cps.

(5) Set meter selector switch on test set (1) to AUDIO POWER OUTPUT.

(6) Adjust volume control R454 for 100 mw output and lock R454.

E. SENSITIVITY TEST

The sensitivity test checks the signal-to-noise ratio of the RA-22B. If the values prescribed in this test cannot be obtained, perform the i-f sensitivity and selectivity test of paragraph 4-4.C.1. to aid in localizing the source of trouble.

(1) Connect equipment as shown in figure 3-5.

(2) Connect wattmeter (3) to WATTMETER connector on test set (1) and set INTERNAL-EXTERNAL switch on test set (1) to EXTERNAL. Connect vtvm (6) across wattmeter terminals.

(3) Adjust test set FREQUENCY SELECTOR for 114.90 mc.

(4) Adjust signal generator (4) for 114.90 mc, 30 per cent modulation at 1000 cps.

(5) Adjust r-f signal voltage for 3 μv. Obtain and record db reading on a-c vtvm (6).

(6) Switch modulation off at signal generator (4) and record db reading on a-c vtvm (6). The minimum difference between the indications obtained in this step and in step (5) should be 6 db.

(7) Switch modulation on at signal generator (4).

(8) Repeat steps (5), (6), and (7) for the following values:

R-f Signal Voltage	DB (min)
100 μv	25
1000 μv	30
50,000 μv	35
100,000 μv	35

NOTE

The following three steps may be performed at any desired frequency or frequencies within the RA-22B VHF range.

(9) For any channel above 117.95 mc turn REMOTE SQUELCH CONTROL on test set (1) fully clockwise (minimum resistance).

(10) Adjust FREQUENCY SELECTOR and signal generator (4) to the desired frequency.

NOTE

Replace signal generator (4) with signal generator (8) (refer to table 3-1) for frequencies above 140 mc and adjust for 30 per cent modulation (at 1000 cps).

(11) Turn modulation on, then off, and note db difference on a-c vtvm (6). Set signal generator output so that difference is 6 db. Signal generator output should be 3 μv or less.

F. SQUELCH TEST

The squelch test checks the operation of the receiver squelch circuit. If the squelch circuit cannot be properly adjusted, use the general troubleshooting techniques outlined in paragraph 4-4.B. to localize the source of trouble with the squelch circuits.

1. Normal Receiver Squelch (Receivers without 4RAX-21/22 Super Squelch)

(1) Connect equipment as shown in figure 3-5 except items (16) and (18).

(2) Set test set FREQUENCY SELECTOR for 118.90 mc.

(3) Adjust signal generator (4) for 118.90 mc, 5 μv, 30 percent modulation at 1000 cps.

(4) Turn REMOTE SQUELCH CONTROL on test set (1) fully counterclockwise.

(5) Vary r-f signal level on signal generator (4) and observe on a-c vtvm (6) the voltage level at which receiver unsquelches. If this is not the desired level, adjust receiver SENS control R415 (figure 1-2).

2. 4RAX-21/22 Super Squelch

(1) Connect the equipment as shown in figure 3-5.

(2) Set the signal general (4) for 127.00 mc, 30% modulation at 1000 cps.

(3) Set FREQUENCY SELECTOR on test panel (1) for 127.00 mc.

(4) Rotate REMOTE SQUELCH CONTROL on test panel (1) fully clockwise.

(5) Vary the r-f signal level on the signal generator (4) and observe on wattmeter (3) the level at which the receiver unsquelches. If this is not the desired r-f signal level, adjust the squelch adjust potentiometer R14.

G. AUDIO JACK TEST

The audio jack test is performed to check the ability of the receiver to provide a clear tone. If a trouble occurs during this test, jack J1 or the connecting wiring must be faulty.

(1) Connect equipment as shown in figure 3-5, and plug earphone (7) into receiver Audio jack.

(2) Adjust test set FREQUENCY SELECTOR and signal generator (4) for a desirable test frequency with 30 percent modulation at 1000 cps.

H. RECEIVER NOISE TEST DURING CHANNEL CHANGE

The noise test during channel change checks that receiver noise is quieted or subdued during stepping relay operation. If receiver noise is not subdued during test in step (4), check continuity in the relay interlock circuits. See figure 6-1.

(1) Connect equipment as shown in figure 3-5.

(2) Plug earphones (7) into receiver AUDIO jack.

(3) Depress and hold receiver SQUELCH TEST switch (figure 1-2) and using earphones (7) note that normal receiver noise is present.

(4) Adjust test set FREQUENCY SELECTOR to next lowest whole megacycle channel, [whole megacycle switch will be rotated through 23 of its 24 positions (23 steps) since it can rotate in single steps in a forward direction only]. Noise generated by stepping relay should be subdued. Receiver noise should be well below volume noted in step (3). During this test, COMM-NAV Transfer relay will operate (but only if pin 3 of connector plug P1 is grounded) to produce a pronounced audible click in the earphones (7). Pin 3 of P1 will be grounded if the NORM-COMM switch on the associated CNA-Y( ) Control is in the COMM position.

I. RECEIVER DISABLING TEST

The receiver disabling test checks the receiver disabling circuit. If a trouble occurs during this test, check the continuity of the receiver disabling signal in the RA-22B using figure 6-1.

(1) Connect equipment as shown in figure 3-5.

(2) Adjust test set FREQUENCY SELECTOR for any communications frequency channel. Also adjust signal generator (4) for this frequency with 200 millivolt output, modulated 30 percent at 1000 cycles.

(3) Plug earphones (7) into receiver AUDIO jack (figure 1-2).

(4) Press RECEIVER DISABLE switch on test set (1) and observe that audio signal disappears.

(5) Reduce signal generator r-f output to 0.

J. TAP TEST

The tap test is performed to check for faulty wiring. If an intermittency or unusual noises occur during this test, examine the receiver for faulty wiring connections.

(1) Connect equipment as shown in figure 3-5 and use the same signal input as in the receiver disabling test in paragraph 3-4.I.(2).

(2) Listen to audio output with earphones (7) while tapping RA-22B chassis. Check that no unusual noises or intermittency occurs.

3-5. POWER SUPPLY TESTS

A. A-C POWER SUPPLY TEST

The a-c power supply test is performed to check that proper power outputs are provided by the a-c power supply. If the values specified in this test and not obtained, refer to the a-c power supply troubleshooting instruction outlined in paragraph 4-4.D.

(1) Connect 3250-ohm load at 10 watts minimum between P101-N and chassis ground.

(2) Connect 5.1-ohm load at 10 watts minimum between P101-F and chassis ground.

(3) Apply 115 vac, 400 cps to P101-M and P101-P.

(4) Set vtvm (2) to 300 vdc scale and measure voltage between P101-N and chassis ground. Reading shall be between 122 and 138 volts.

(5) Set vtvm (6) to 10 vac scale and measure ripple between P101-N and chassis ground. Ripple shall be no more than four volts rms.

(6) Set vtvm (6) to 10 vac scale and measure voltage between P101-F and chassis ground. Reading shall be between 6.0 and 6.6 volts rms.

B. D-C POWER SUPPLY TEST

The d-c power supply test is performed to check that proper power outputs are provided by the d-c power supply. If the values specified in this test are not obtained, refer to the d-c power supply troubleshooting instruction outlined in paragraph 4-4.E.

(1) Connect 3250-ohm load at 10 watts minimum between P101-N and chassis ground.

(2) Apply 20 VDC to P101-B, and ground to P101-P.

(3) Set to 300 vdc scale and measure voltage between P101-N and chassis ground; vtvm (2) reading shall be between 125 and 135 volts.

(4) Set vtvm (6) to 1.0-volt scale and measure ripple between P101-N and chassis ground. Ripple must be no more than 0.23 vac (rms).

3-6. TEST-TO-MAINTENANCE REFERENCE TABLE

Table 3-2 lists normal results expected of tests performed in this section and provides reference to section IV corrective maintenance instructions in the event that normal results are not obtained. Tests are arranged in a logical sequence of equipment checkout. Any problem encountered during a test should be corrected before proceeding further.

3-6. (Cont'd)

TABLE 3-2.

TEST-TO-MAINTENANCE REFERENCE TABLE

TEST	NORMAL RESULTS EXPECTED	PER PARAGRAPH	IF RESULTS ARE ABNORMAL, REFER TO
STEPPING SWITCH	(a) 2 mc operates from 151 to 108 mc. Rotation time 4 sec	3-4.A, step (2)	Figure 4-14 Par. 4-3
	(b) 0.1 mc operates from 0.9 to 0.0 mc. Rotation time 4 sec	3-4.A, step (3)	Figure 4-15 Par. 4-3
FUNCTION SWITCH	(a) ILS lamp lights on odd 100 kc from 108 to 111 mc	3-4.B, step (2)	Figure 6-1
	(b) COMM-NAV lamp lights between 118 and 151 mc	3-4.B, step (3)	Figure 6-1
	(c) COMM-NAV lamp lights between 116 and 151 mc	3-4.B, step (4)	
AVC	1.5 db max	3-4.C, step (7)	Par. 4-4.C.2
AUDIO LEVEL	Obtain 100 mw.	3-4.D, step (8)	Par. 4-4.C.3
SENSITIVITY	(a) 6 db min	3-4.E, step (7)	Par. 4-4.C.1
	(b) 6 db min	3-4.E, step (7) 3-4.E, step (9)	Par. 4-4.C.1
	(c) At / Db (min) 100 μv / 25 1 mv / 30 50 mv / 35 100 mv / 35		Par. 4-4.C.1 Par. 4-4.C.1
	(d) 6 db min	3-4.E, step (12)	Par. 4-4.C.1
SQUELCH	Receiver unsquelches	3-4.F, step (6)	Par. 4-4.B
AUDIO JACK	Audible 1000 cps tone	3-4.G, step (5)	Par. 4-4.B
CHANNEL CHANGE MUTING	Stepping switch noise muted while switch rotates.	3-4.H, step (5)	Par. 4-4.B
RECEIVER DISABLING	(a) Audio signal disappears	3-4.I, step (5)	Par. 4-4.B
TAP	No unusual noise or intermittency	3-4.J, step (2)	Par. 3-4.J
A-C POWER SUPPLY	(a) Between 122 and 138 vdc at P101-N	3-4.A, step (4)	Par. 4-4.D
	(b) 4 vac max ripple at P101-N	3-4.A, step (5)	Par. 4-4.D
	(c) Between 6.0 and 6.6 volts rms at P101-F	3-4.A, step (6)	Par. 4-4.D
D-C POWER SUPPLY	(a) Between 125 and 135 vdc at P101-N	3-4.B, step (3)	Par. 4-4.E
	(b) 0.23 vac max ripple at P101-N	3-4.B, step (4)	Par. 4-4.E

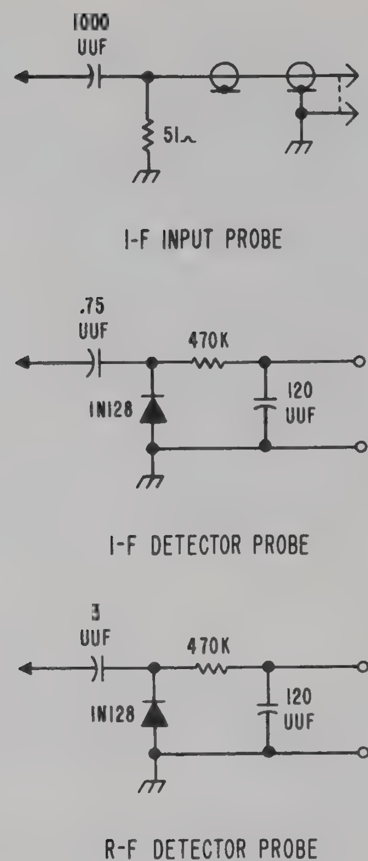

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Figure 3-6. R-f and I-f Probes, Schematic Diagram

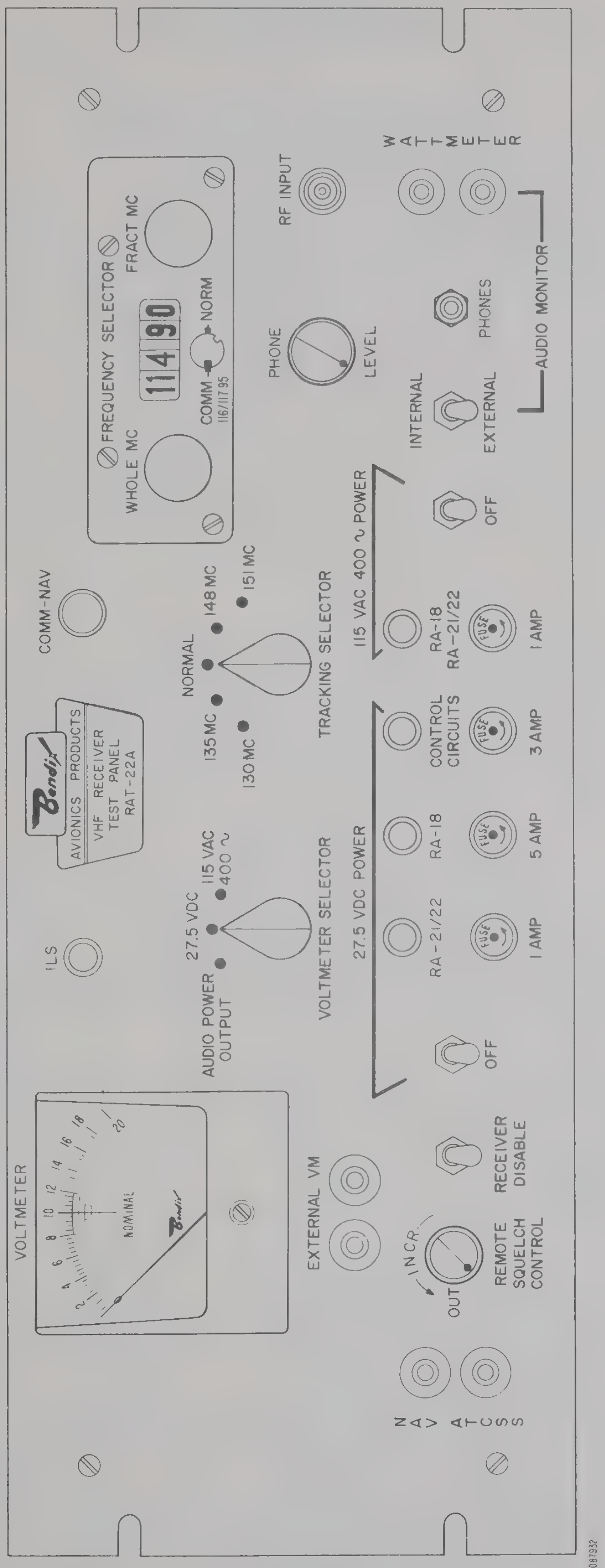

Figure 3-7. RAT-22A VHF Receiver Test Set, Front Panel

SECTION IV. MAINTENANCE

4-1. GENERAL

This section contains procedures for troubleshooting, alignment, repair, and general maintenance of the RA-22B VHF Receiver. Illustrations are also provided as an aid in locating and identifying parts which are to be repaired or replaced.

4-2. CLEANING

After the equipment has been in service over a period of time, dust and oil film may accumulate sufficiently to impede the operation of the stepping switches. Clean the receiver with compressed air (100 psi), and the stepping-switch ratchets, detents, and gear train with trichlorethylene. Clean the printed-circuit inductances with contact cleaner (Cobehn).

4-3. LUBRICATION

The RA-22B contains two solenoid stepping switches, 2 megacycle stepper K102 and 0.1 megacycle stepper K104, that should be periodically lubricated. Table 4-1 is a lubrication chart, which provides all pertinent lubrication instructions; and figure 4-1 is a view of a typical solenoid stepping switch showing lubrication points, with items numerically keyed to the chart in table 4-1 .

TABLE 4-1.

SOLENOID STEPPING SWITCH LUBRICATION CHART

KEY TO FIG. 4-2	POINT OF LUBRICATION*	TYPE OF LUBRICANT	METHOD OF APPLICATION	AMOUNT	REMARKS
1	Ball Races and Sleeve Bearing	MIL-G-3278	Brush	Film Coat	Apply to either case or armature ball races.
2	Drive Plate	MIL-G-3278	Brush	Film Coat	Apply to points of friction contact.
3	Centering Plate	DC-510	Hypodermic Needle	One Drop Each Point	Apply to ratchet side and spring side at points of spring contact.
4	Driver Ratchet	DC-510	Hypodermic Needle	One Drop	Apply to ratchet teeth.
5	Driven Ratchet	DC-510	Hypodermic Needle	One Drop	Apply to ratchet teeth and thrust washer side.
6	Latch Wheel or Thrust Washer	DC-510	Hypodermic Needle	One Drop	Apply to thrust washer side.
7	Cam	DC-510	Hypodermic Needle	One Drop	Apply to both sides.

* Refer to figure 4-8 for lubrication point call-outs.

TABLE 4-1. (Con't)

SOLENOID STEPPING SWITCH LUBRICATION CHART

KEY TO FIG. 4-2	POINT OF LUBRICATION*	TYPE OF LUBRICANT	METHOD OF APPLICATION	AMOUNT	REMARKS
8	Figure Eight Bracket	DC-510	Hypodermic Needle	One Drop	Apply to bearing hole.
9	Wafer	MIL-G-3278	Brush	Film Coat	Apply to both sides of rotor.
10	Detent Rotor	MIL-G-3278	Brush	Film Coat	Apply to ball bearing side and to extruded side around shaft hole.
11	Outboard Bearing Strap	MIL-G-3278	Brush	Film Coat	Apply to bearing hole.

* Refer to figure 4-8 for lubrication point call-outs.

MIL-G-3278 includes the following commercial lubricants:
Beacon #325, Aeroshell #11, Unitemp, etc.
DC-510 is Dow-Corning #510

4-4. TROUBLESHOOTING

A. TEST EQUIPMENT RECOMMENDED

The recommended test equipment for the troubleshooting procedures is listed in table 3-1. Those items with an asterisk are used exclusively in section IV.

B. GENERAL TROUBLESHOOTING TECHNIQUES

If an RA-22B VHF Receiver unit is defective, the receiver tests given in paragraph 3-4 should be used for preliminary trouble analysis. The material in the following paragraphs will aid in locating trouble to the specific defective components.

The troubleshooting tests given in paragraph 4-4C can be used to locate trouble to either the i-f circuits, the avc circuits, the audio circuits, or the r-f circuits. These tests should be performed in the sequence given unless trouble is suspected in one specific area. In this case the tests will aid in determining whether the trouble is due to a lack of alignment or a defective stage or component.

If a lack of alignment is suspected, perform the corresponding alignment procedures in paragraph 4-5. Then go through the troubleshooting test procedure again to check that the alignment was successful.

If a defective stage or component is suspected within a circuit, use conventional troubleshooting methods to locate the trouble. Use the schematic diagram in figure 6-1 in conjunction with the component location diagrams (paragraph 4-4.F), the voltage and resistance charts (paragraph 4-4.G), test point charts (pargaraph 4-4.H), and stepping switch continuity chart (paragraph 4-4.I) as required.

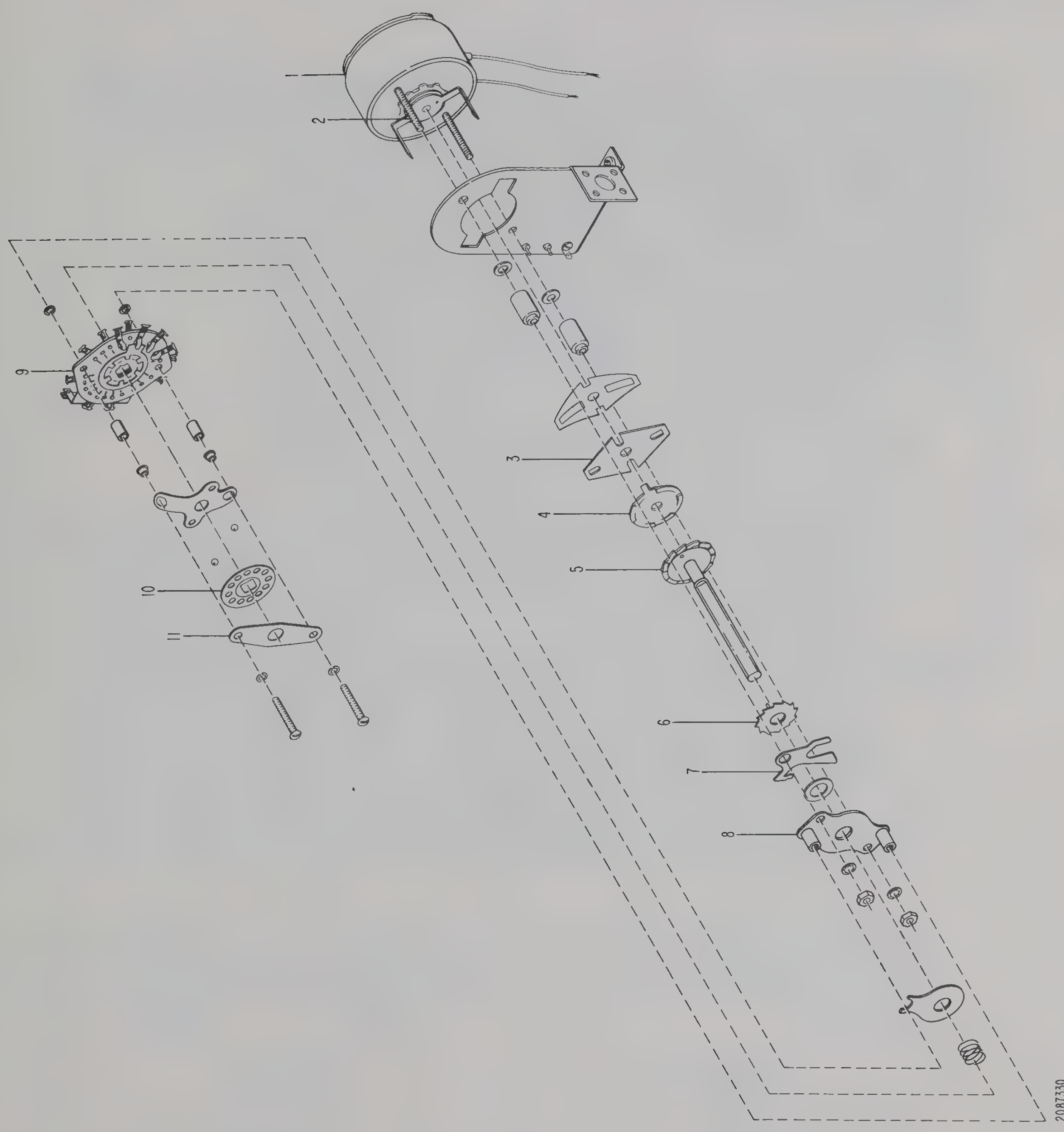

Figure 4-1. Typical Solenoid Stepping Switch, Lubrication Points

Troubleshooting instructions for the a-c and d-c power supplies are outlined in paragraph 4-4.D and 4-4.E. Schematic diagrams of these power supplies provided in figures 6-2, 6-3, and 6-4 can be used as a guide in making voltage and resistance checks.

C. TROUBLESHOOTING TESTS

NOTE

All test points and internal adjustments called out in these tests are illustrated in figures 4-2 and 4-3.

1. I-f Sensitivity and Selectivity Test

(1) Connect equipment as shown in figure 4-4. Use standard 6-volt batteries.

(2) Adjust test set FREQUENCY SELECTOR for 114.90 mc and signal generator (17) for 3.775 mc.

(3) Adjust signal generator (17) for 0 volts and record noise indication on vtvm (2).

(4) Increase signal generator input voltage to obtain a voltage level of 1 volt above noise level indication on vtvm (2). R-f signal voltage should be less than 25 μv. Also record db units on signal generator (17) as a reference.

(5) Repeat steps (3) and (4) with signal generator (17) adjusted for 3.795 mc, 3.755 mc, 3.811 mc, and 3.739 mc, respectively. The difference in db between reference level obtained in step (4) and db values obtained at each test frequency should be as follows:

Frequency (mc)	DB Difference
3.755	6 db (max)
3.795	6 db (max)
3.811	60 db (min)
3.739	60 db (min)

(6) Repeat steps (3) and (4) with signal generator (17) adjusted for 3.725 and FREQUENCY SELECTOR for 114.95 mc. Indication should be within ±1.6 db of reading obtained in step (4).

(7) Repeat step (6) with FREQUENCY SELECTOR adjusted for 114.95 mc and signal generator (17) set to 3.705 mc, 3.745 mc, 3.761 mc, and 3.689 mc, respectively. The difference between db level obtained for each frequency and db reference obtained in step (6) should be as follows:

Frequency (mc)	DB Difference
3.705	6 db (max)
3.745	6 db (max)
3.689	60 db (min)
3.761	60 db (min)

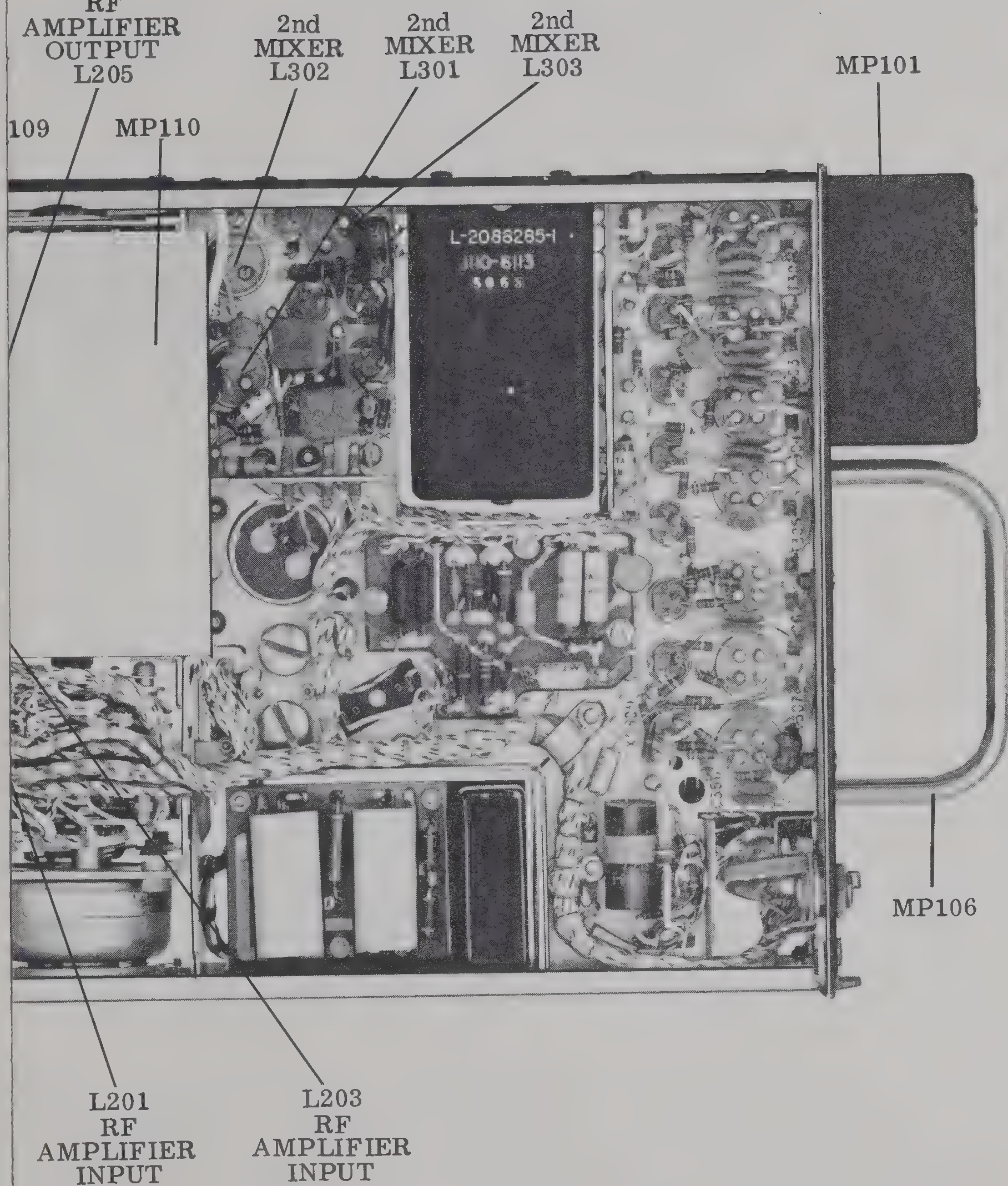

Figure 4-3. RA-22B VHF Receiver, Left-Side Test Points and Adjustments

Troubleshooting instructions for the a-c and d-c power supplies are outlined in paragraph 4-4.D and 4-4.E. Schematic diagrams of these power supplies provided in figures 6-2, 6-3, and 6-4 can be used as a guide in making voltage and resistance checks.

C. TROUBLESHOOTING TESTS

NOTE

All test points and internal adjustments called out in these tests are illustrated in figures 4-2 and 4-3.

1. I-f Sensitivity and Selectivity Test

(1) Connect equipment as shown in figure 4-4. Use standard 6-volt batteries.

(2) Adjust test set FREQUENCY SELECTOR for 114.90 mc and signal generator (17) for 3.775 mc.

(3) Adjust signal generator (17) for 0 volts and record noise indication on vtvm (2).

(4) Increase signal generator input voltage to obtain a voltage level of 1 volt above noise level indication on vtvm (2). R-f signal voltage should be less than 25 μv. Also record db units on signal generator (17) as a reference.

(5) Repeat steps (3) and (4) with signal generator (17) adjusted for 3.795 mc, 3.755 mc, 3.811 mc, and 3.739 mc, respectively. The difference in db between reference level obtained in step (4) and db values obtained at each test frequency should be as follows:

Frequency (mc)	DB Difference
3.755	6 db (max)
3.795	6 db (max)
3.811	60 db (min)
3.739	60 db (min)

(6) Repeat steps (3) and (4) with signal generator (17) adjusted for 3.725 and FREQUENCY SELECTOR for 114.95 mc. Indication should be within ±1.6 db of reading obtained in step (4).

(7) Repeat step (6) with FREQUENCY SELECTOR adjusted for 114.95 mc and signal generator (17) set to 3.705 mc, 3.745 mc, 3.761 mc, and 3.689 mc, respectively. The difference between db level obtained for each frequency and db reference obtained in step (6) should be as follows:

Frequency (mc)	DB Difference
3.705	6 db (max)
3.745	6 db (max)
3.689	60 db (min)
3.761	60 db (min)

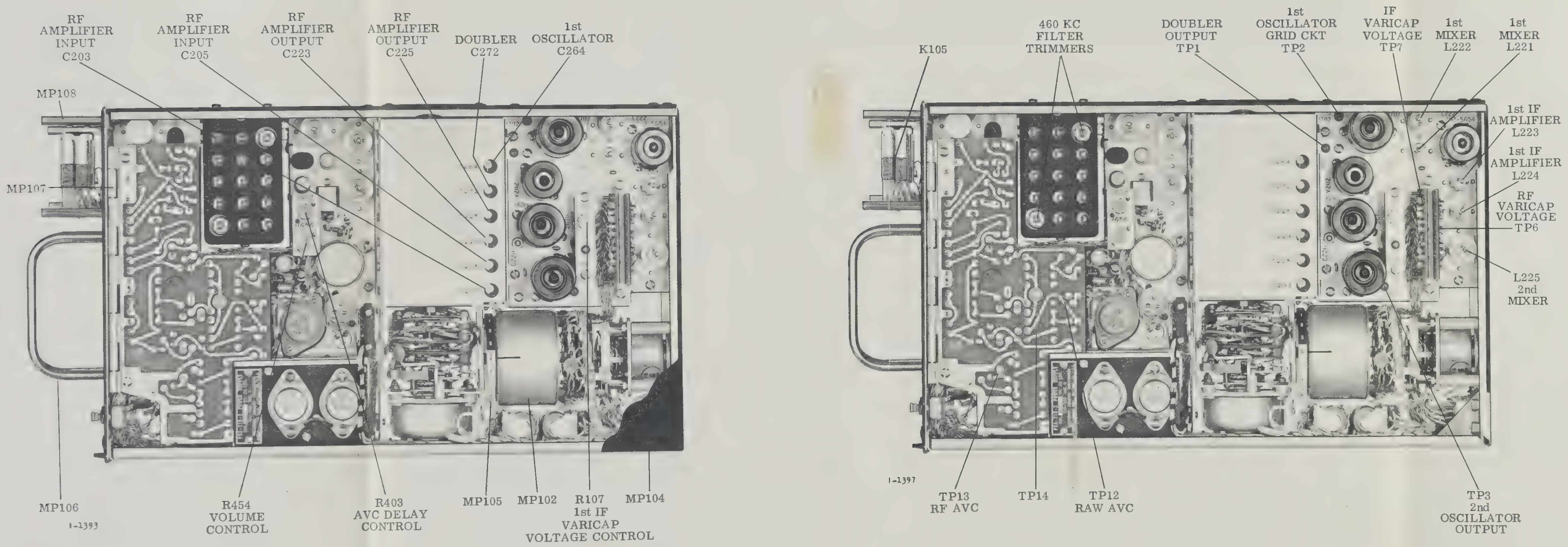

Figure 4-2. RA-22B VHF Receiver, Right-Side Test Points and Adjustments

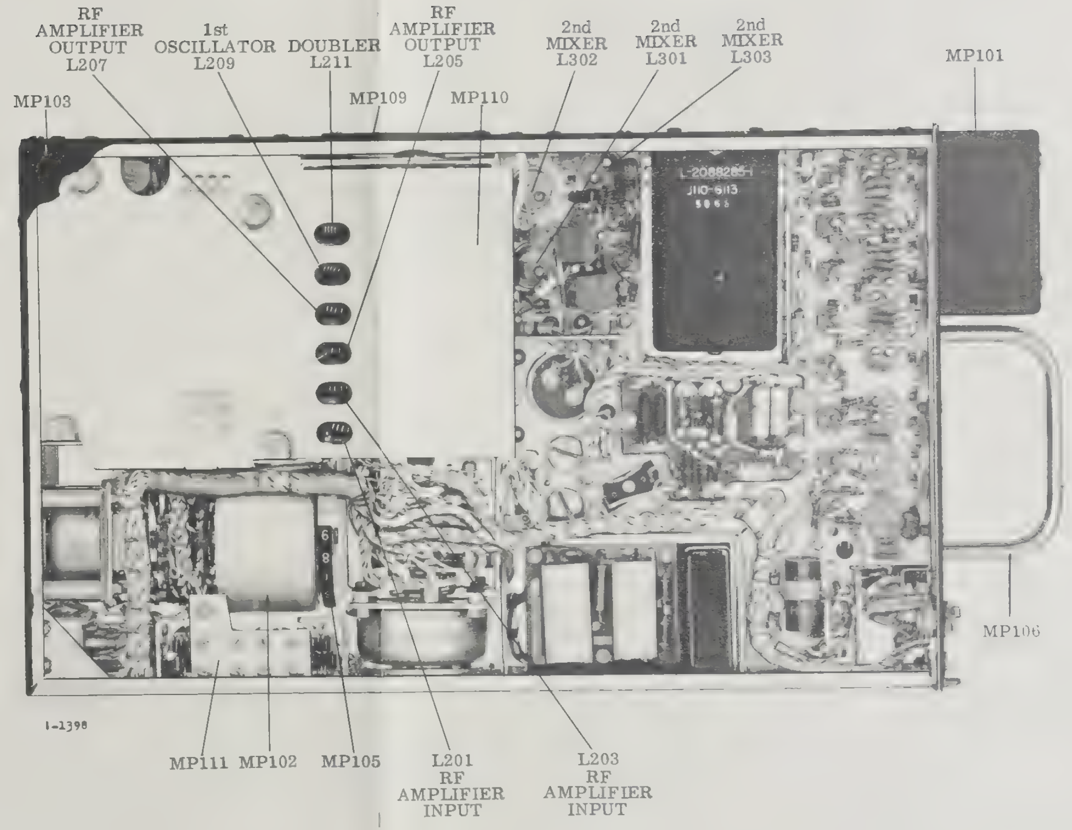

Figure 4-3. RA-22B VHF Receiver, Left-Side Test Points and Adjustments

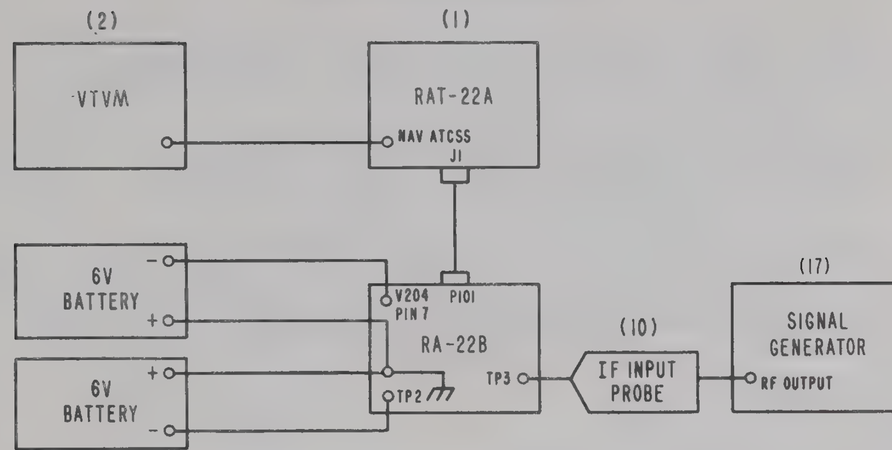

Figure 4-4. I-f Sensitivity and Selectivity Test Setup

2. Avc Test

(1) Connect equipment as shown in figure 4-5.

(2) Adjust signal generator (17) for 3.775mc, 400 μv, 30 per cent modulation at 1000 cps.

(3) Set a-c vtvm (6) to 1-volt a-c scale.

(4) Adjust test set FREQUENCY SELECTOR for 114.90 mc.

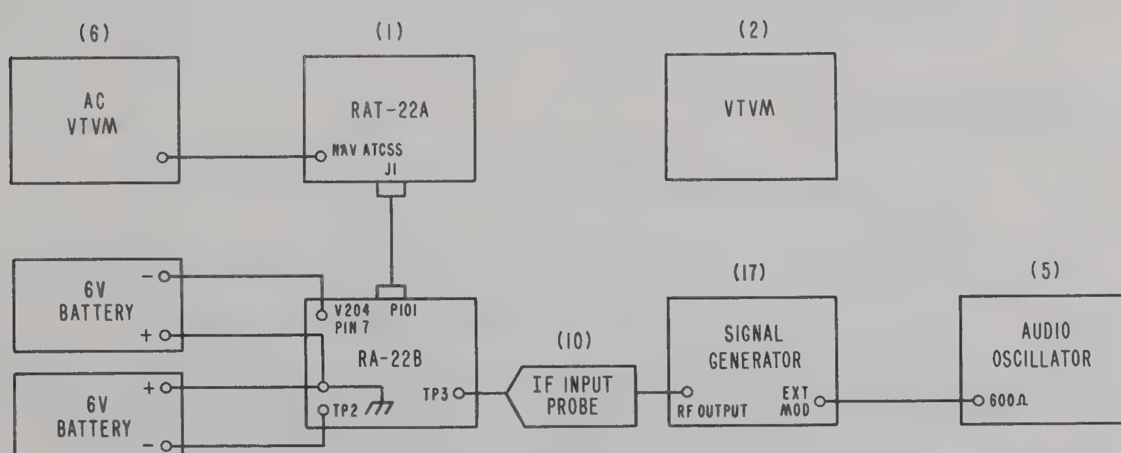

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Figure 4-5. Avc Troubleshooting Test Setup

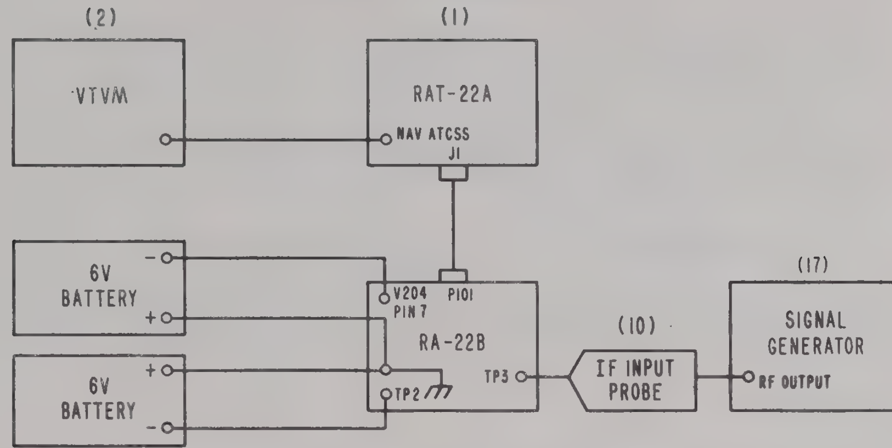

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Figure 4-4. I-f Sensitivity and Selectivity Test Setup

2. Avc Test

(1) Connect equipment as shown in figure 4-5.

(2) Adjust signal generator (17) for 3.775mc, 400 μv, 30 per cent modulation at 1000 cps.

(3) Set a-c vtvm (6) to 1-volt a-c scale.

(4) Adjust test set FREQUENCY SELECTOR for 114.90 mc.

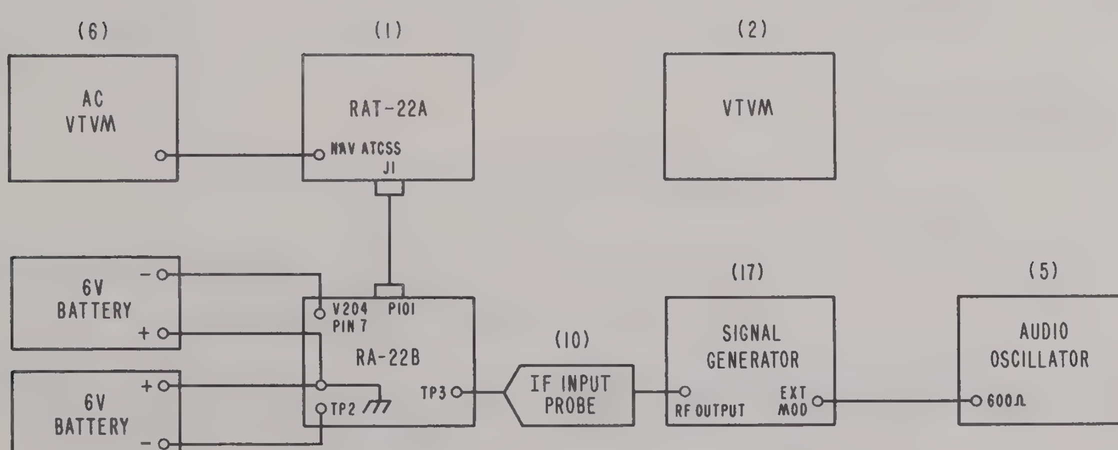

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Figure 4-5. Avc Troubleshooting Test Setup

(5) Adjust avc delay control R403 to obtain 0.5 volt ac and lock R403.

(6) Adjust signal generator (17) to obtain a 6 db difference between readings on a-c vtvm (6) with and without modulation. Input signal should not exceed 25 μv.

(7) Adjust signal generator (17) for 3.725 mc. (Refer to step 2.)

(8) Adjust FREQUENCY SELECTOR for 114.95 mc.

(9) Repeat step (6).

(10) Check voltages at the following test points on vtvm (2) with 0 r-f input:

Test Point	Limits
TP12 (raw avc)	12 to 15 vdc
TP13 (r-f avc)	10 to 13 vdc
TP14 (i-f avc)	9 to 12 vdc

(11) Adjust r-f input to obtain 10 volts dc output at TP12. R-f input voltage should be less than 100 μv.

(12) Adjust r-f input for 400 μv and observe output at TP12 (5 volts min, 8 volts max).

(13) Adjust r-f input to obtain 2-volt dc raw avc voltage. R-f input voltage should be less than 4000 μv. Record db indication as a reference for the audio level test which follows. Audio output at NAV ATCSS jack on test set should be between 0.5 and 0.6 volt ac.

3. Audio Level Test

(1) Connect equipment as shown in figure 4-6.

(2) Adjust signal generator (17) for 3.775 mc, with 30 percent modulation at 1000 cps, and with an r-f output 3 db less than that required in paragraph 4-4.C.2, step (14).

(3) Adjust test set FREQUENCY SELECTOR for 114.90 mc and adjust avc delay control R403 to obtain 0.5 volt ac on a-c vtvm (6) at NAV ATCSS jack on test set. Lock R403.

(4) Connect audio oscillator (5) to signal generator (4).

(5) Set audio oscillator (5) for 150 cps and 10 kc, respectively, and record output voltage at NAV ATCSS jack for both of these frequencies. For 150 cps, output voltage should be between 0.45 and 0.55 volt ac; for 10 kc, output voltage should be between 0.40 and 0.55 volt ac.

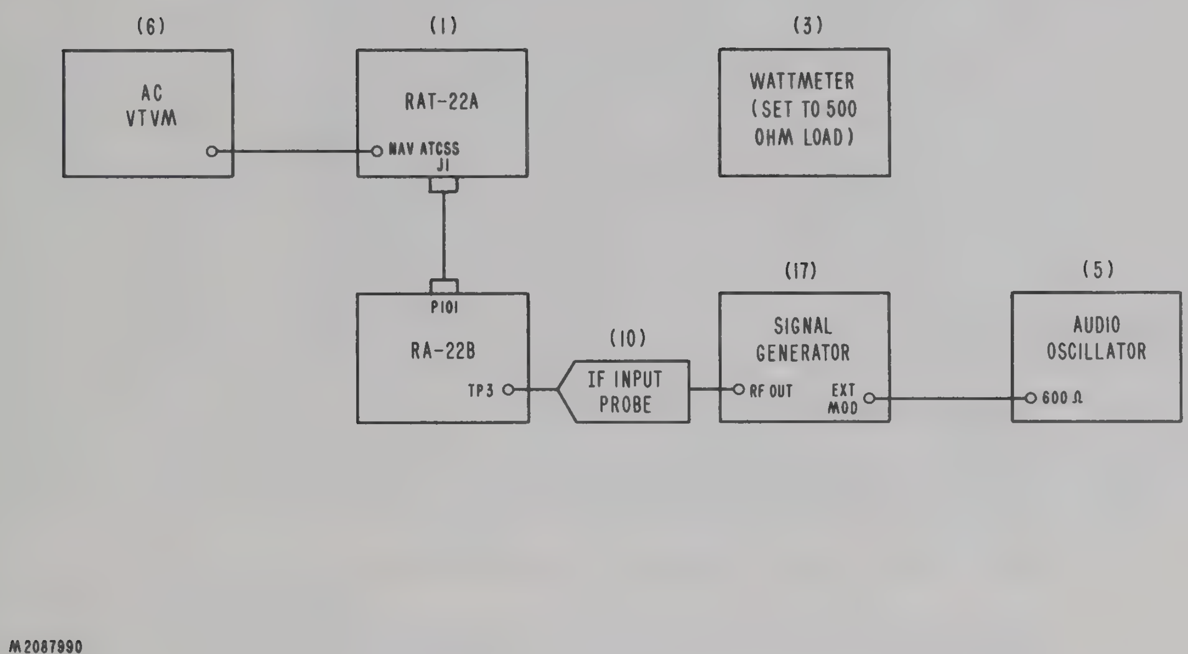

Figure 4-6. Audio Level Troubleshooting Test Setup

4. I-f Varicap Tuning Test

(1) Connect RA-22B to test set.

(2) Adjust FREQUENCY SELECTOR for 108.00 mc.

(3) Connect vtvm (2) to TP7.

(4) Adjust potentiometer R107 for 13 volts dc on vtvm (2).

(5) Adjust test set FREQUENCY SELECTOR for the following frequencies and observe that the corresponding d-c voltages are within the prescribed limits:

Frequency	Limits
108.20	14.5 to 14.8 vdc
108.40	15.5 to 15.8 vdc
108.60	17.2 to 17.9 vdc
108.80	18.8 to 19.3 vdc
109.00	20.3 to 21.2 vdc
109.20	22.2 to 23.2 vdc
109.40	24.0 to 25.2 vdc
109.60	26.0 to 27.8 vdc
109.80	28.8 to 30.2 vdc

5. R-f Varicap Test

(1) Connect RA-22B to test set.

(2) Adjust FREQUENCY SELECTOR for 109.00 mc.

(3) Connect vtvm (2) to TP6. Observe that reading is between 41.5 and 44.5 vdc.

(4) Adjust FREQUENCY SELECTOR for 108.00 mc. Observe that vtvm (2) reads between 25 and 28 vdc.

6. Crystal Tests

a. First Oscillator

(1) Connect RA-22B to test set.

(2) Connect vtvm (2) to TP1.

(3) Adjust test set FREQUENCY SELECTOR for odd whole megacycle frequency to be checked and obtain voltage indication on vtvm (2). The vtvm indication should be within the limits of 0.55 and 1.00 volt ac.

NOTE

Whole megacycle crystals are selected by switch wafer S101L in the RA-22B. (See figure 6-1.)

(4) Connect frequency counter (10) through a 10 $\mu\mu$f capacitor to TP1 to obtain the doubler output frequency of the whole megacycle crystal being checked. Table 4-2 indicates the doubler output frequency limits for each crystal. Ideally, the proper frequency is exactly centered between these limits; thus, for crystal Y101, 93.000000 mc is the center frequency.

4-4.C.6.a. (Cont'd)

TABLE 4-2.

FIRST OSCILLATOR WHOLE MEGACYCLE CRYSTAL FREQUENCIES (doubled)

FREQ. SEL. POS.	CRYSTAL	TP1 MC FREQ LIMITS		FREQ. SEL. POS.	CRYSTAL	TP1 MC FREQ LIMITS	
		MIN	MAX			MIN	MAX
109	Y101	92.996280	93.003720	131	Y112	114.995975	115.004025
111	Y102	94.996200	95.003800	133	Y113	116.995905	117.004095
113	Y103	96.996120	97.003880	135	Y114	118.995835	119.004165
115	Y104	98.996040	99.003960	137	Y115	120.995765	121.004235
117	Y105	100.995960	101.004040	139	Y116	122.995695	123.004305
119	Y106	102.995880	103.004120	141	Y117	124.995625	125.004375
121	Y107	104.996325	105.003675	143	Y118	126.995555	127.004445
123	Y108	106.996255	107.003745	145	Y119	128.995485	129.004515
125	Y109	108.996185	109.003815	147	Y120	130.995415	131.004585
127	Y110	110.996115	111.003885	149	Y121	132.995345	133.004655
129	Y111	112.996045	113.003955	151	Y122	134.995275	135.004725

b. Second Oscillator

(1) Connect RA-22B to test set.

(2) Connect vtvm (2) to TP3.

(3) Adjust FREQUENCY SELECTOR for fractional megacycle frequency to be checked and obtain voltage indication on vtvm (2). The vtvm indication should be within the limits of 0.55 and 1.10 volts.

NOTE

Fractional megacycle crystals are selected by switch wafer S102D in the RA-22B. (See figure 6-1.)

(4) Connect frequency counter (10) to TP3 to obtain the frequency of the fractional megacycle crystal being checked. Table 4-3 indicates the frequency limits for each crystal. Ideally the proper frequency is exactly centered between these limits; thus, for crystal Y131, 18.775000 mc is the center frequency.

TABLE 4-3.

SECOND OSCILLATOR FRACTIONAL MEGACYCLE CRYSTAL FREQUENCIES

FREQ. SEL. POS.	CRYSTAL	TP3 MC FREQ. LIMITS		FREQ. SEL. POS.	CRYSTAL	TP3 MC FREQ. LIMITS	
		MIN	MAX			MIN	MAX
108.00	Y131	18.774343	18.775657	109.00	Y141	19.774209	19.775691
108.10	Y132	18.874340	18.875660	109.10	Y142	19.874206	19.875694
108.20	Y133	18.974336	18.975664	109.20	Y143	19.974202	19.975698
108.30	Y134	19.074333	19.075667	109.30	Y144	20.074199	20.075701
108.40	Y135	19.174329	19.175671	109.40	Y145	20.174195	20.175705
108.50	Y136	19.274326	19.275674	109.50	Y146	20.274192	20.275708
108.60	Y137	19.374322	19.375678	109.60	Y147	20.374188	20.375712
108.70	Y138	19.474319	19.475681	109.70	Y148	20.474185	20.475715
108.80	Y139	19.574315	19.575685	109.80	Y149	20.574182	20.575718
108.90	Y140	19.674312	19.675688	109.90	Y150	20.674188	20.675722

7. Third Oscillator Test

(1) Connect equipment as shown in figure 4-7.

(2) **Adjust signal generator (8) for 114.90 mc, 1000 μv, 30 per cent modulation at 1000 cps.**

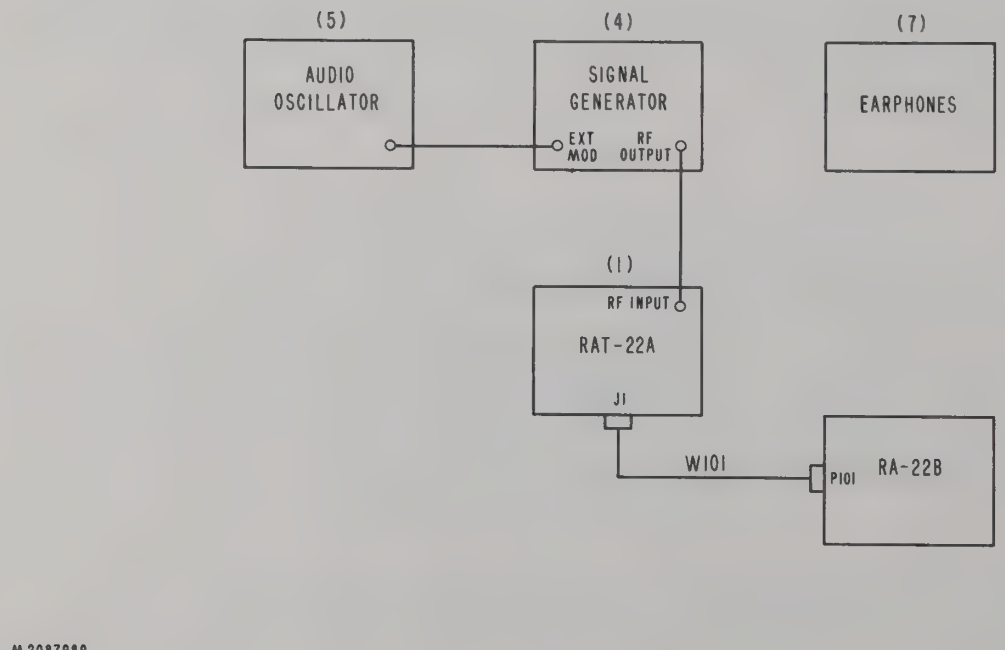

Figure 4-7. Third Oscillator Crystal Check Test Setup

(3) Set FREQUENCY SELECTOR for 114.90 mc.

(4) Plug earphones (7) into test set PHONES jack. A 1000-cycle tone should be heard.

(5) Adjust signal generator (17) and FREQUENCY SELECTOR for 114.95 mc. A 1000-cycle tone should be heard.

NOTE

If a clear tone is heard, it is assumed that third oscillator crystals Y301 and Y302 are operating properly.

D. TROUBLESHOOTING A-C POWER SUPPLIES

If the a-c power supply fails to provide the proper outputs, perform continuity and voltage checks using figure 6-2, a schematic diagram of the circuit, to isolate faulty components.

E. TROUBLESHOOTING D-C POWER SUPPLIES

Table 4-4 lists voltage measurements for the d-c power supply; corresponding resistance measurements are listed in table 4-5. Use these together with the schematic diagrams in figures 6-3 and 6-4 to isolate faulty components.

TABLE 4-4.

D-C POWER SUPPLY, VOLTAGE MEASUREMENTS, OSCILLATOR SECTION

Conditions: All measurements d-c unless otherwise stated. Use vtvm (2).			
VOLTAGES TO GROUND			
	BASE	COLLECTOR	EMITTER
Q101	25 and 19.5 vac	0	20 vdc and 14 vac
Q102	25 and 18.5 vac	0	20 vdc and 14 vac

TABLE 4-5.

D-C POWER SUPPLY, RESISTANCE MEASUREMENTS, OSCILLATOR SECTION

Conditions: Rear plugs disconnected. Resistance measurements on 10X scale unless otherwise noted. All measurements in ohms, unless otherwise stated. Use multimeter (15) with common lead grounded.						
RESISTANCE TO GROUND						
	+PROBE ON BASE	- PROBE ON BASE	+PROBE ON EMITTER	-PROBE ON EMITTER	+PROBE ON COLLECTOR	-PROBE ON COLLECTOR
Q101	2500	10	0	0	50	90
Q102	2500	10	0	0	50	90

F. PARTS LOCATION

The parts locations for the RA-22B are provided in figures 4-8 through 4-13. These illustrations may be used in conjunction with the schematic diagram for the receiver in figure 6-1 when isolating a trouble down to the component level.

G. VOLTAGE AND RESISTANCE MEASUREMENTS

Voltage and resistance measurements for all tubes and transistors are provided in tables 4-6 through 4-9 as an aid in troubleshooting. In addition, a resistance check chart for the pin of rear connector J2 is given in table 4-10.

CAUTION

Be careful not to short any point of voltage measurement to chassis or other terminal as permanent damage to the transistors will result. Use multimeter (15) or equivalent meter having at least 20, 000 ohms/volt sensitivity.

TABLE 4-6.

VACUUM TUBE PIN VOLTAGE MEASUREMENTS

Conditions: Frequency setting at 118.00 mc.
1000 mv input through 6-db pad, modulated 30 per cent at 1000 cps.
SENS control set to unsquelch at 5 μv.
All measurements + dc unless otherwise stated.
Use multimeter (15) or vtvm (2).

TUBE SYMBOL NO.	FUNCTION	PIN NO.								
		1	2	3	4	5	6	7	8	9
V201	R-f Amplifier	18.9 vdc or 6.3 vac	7.7	(avc)	125	0	126	(avc)	7.7	12.7
V202	1st Mixer	0	3.5 *0.5-1.2 vac	0	6.2 or 6.3 vac	124	124	3.5 *0.5-1.2 vac	-	-
V203	1st i-f Amplifier	(avc)	8.4	6.2 or 6.3 vac	0	125	120	8.4	-	-
V204	2nd Mixer 2nd Oscillator	12.6	3.3 *0.5-1.2 vac	0	116	0	128	*-4	0	6.2 or 6.3 vac
V205	1st Oscillator Doubler	25.2	0	*-1 to -3	105	0	96	*-4.8	0	19 or 6.3 vac

*Use vtvm (2).

CAUTION

Do not use an a-c operated vtvm to make resistance measurements. To make resistance measurements, use an ohmmeter with battery voltage (on RX1000 range) of 1.5 volts or less.

TABLE 4-7.

VACUUM TUBE PIN RESISTANCE MEASUREMENTS

Conditions: Rear plug and power supply plug disconnected.
Frequency set at 118.50 mc.
All measurements from pins to ground.
All measurements in ohms, unless otherwise specified.
Use multimeter (15) or equivalent, common grounded.

TUBE SYMBOL NO.	FUNCTION	PIN NO.								
		1	2	3	4	5	6	7	8	9
V201	R-f Amplifier	11	350	700K	30K	0	30K	700K	350	7
V202	1st Mixer	90K	1K	0	3	30K	30K	1K	-	-
V203	1st I-f Amplifier	700K	1K	3	0	30K	75K	1K	-	-
V204	2nd Mixer/ 2nd Oscillator	7	2.7K	0	36K	0	42K	42K	0	3
V205	1st Oscillator/ Doubler	15	0	500K	30K	0	36K	450K	0	11

TABLE 4-8.

TRANSISTOR VOLTAGE MEASUREMENTS

Conditions: Frequency setting at 110.00 mc.
1000 μv input through 6-db pad, 30 percent modulation at 1000 cps.
SENS control set to unsquelch at 5 μv.
All measurements + dc unless otherwise stated.
Use multimeter (15) or equivalent, unless otherwise specified.
Use a-c vtvm voltmeter (2) for Q301-Q311 r-f measurements.
Use voltmeter (6) for audio measurements for Q400 series transistors.

TRANSISTOR SYMBOL NO.	VOLTAGES TO GROUND		
	BASE	EMITTER	COLLECTOR
Q101	13	12.8	23.3
Q102	25.2	25.5	19.5
Q301	0.5 to 1.0 vac and 4.5 vdc	5.4	16
Q302	14.3	14.5	19.5
Q303	2.6	2.6	5.2
Q304	14.3	14.5	19.5
Q305	8.3	8.2	11 vdc and 0.05 vac
Q306	11.5	11.3	17 vdc and 0.31 vac
Q307	1.5	1.3	9.6 vdc and 1.4 vac
Q308	1.5	1.3	8.4 vdc and 2 vac
Q309	1.7	4.1	18.8
Q310	0.5 to 1.0 vac and 4.5	5.3	16
Q311	0.5 to 1.0 vac and 4.5	5.6	19.5
Q401	0.5 vac and 4.1	4.3	0
Q402	3.9	3.7	9.5
Q403	9.5	9.3	17.4
Q404	17.4	17.5	5.1
Q405	2.3	2.1	5.2
Q406	0.86	0.41	13.8
Q407	3.7	4.3	12
Q408	0.02 vac and 11.8	11.8	0.1 vac and 21
Q409	0.09 vac and 21.5	21.8	4.4 vac and 11.8
Q410	4.4 vac and 11.8	4.4 vac and 12	0
Q411	11.8	12	0

TABLE 4-9.

TRANSISTOR RESISTANCE MEASUREMENTS

Conditions: Resistance measurements on 1000X scale unless otherwise indicated.
All plugs disconnected.
R403, R415, and R454 set fully clockwise.
Use multimeter (15).

TRANSISTOR SYMBOL NO.	RESISTANCE TO GROUND					
	+ PROBE ON BASE	- PROBE ON BASE	+ PROBE ON EMITTER	- PROBE ON EMITTER	+ PROBE ON COLLECTOR	- PROBE ON COLLECTOR
Q101	450	2K	350	300	350	300
Q102	380	300	250	300	220	220
Q301	2K	12K	9.4K	3.2K	6.3K	3.2K
Q302	2.2K	1.4K	39K	1.7K	3K	1.7K
Q303	2.6K	5.4K	4.4K	2.4K	390K RX 100K scale	2.4K
Q304	2.4K	2.5K	340K RX100K scale	2K	3K	2K
Q305	4K	11K	370K RX100K scale	2.9K	280K RX100K scale	2.9K
Q306	3.8K	11K	280K RX100K scale	2.7K	4.6K	2.7K
Q307	700	850	650	550	5.3K	650
Q308	700	850	650	500	5.5K	600
Q309	300	300	3.8K	500	1.1K	500
Q310	2K	12K	200K	3.7K	4.7K	3.6K
Q311	2K	12K	200K	3.7K	4.7K	3.6K
Q401	4.3K	450	400	2.1K	0	0
Q402	2.2K	16K	1.7K	1.4K	2.3K	1.7K
Q403	2.3K	1.7K	1.8K	900	8K	900
Q404	8K	900	900	1.1K	1.8K	4.4K
Q405	0	0	450	350	1.4K	450
Q406	8.5K	30K	2.3K	16K	∞	15K
Q407	4.2K	18K	5.2K	4K	5.5K	4K
Q408	4.8K	8.5K	5K	3K	4.8K	3K
Q409	11K	850	850	1.1K	1.6	400
Q410	1.6K	400	400	300	0	0
Q411	400	250	200	350	0	0

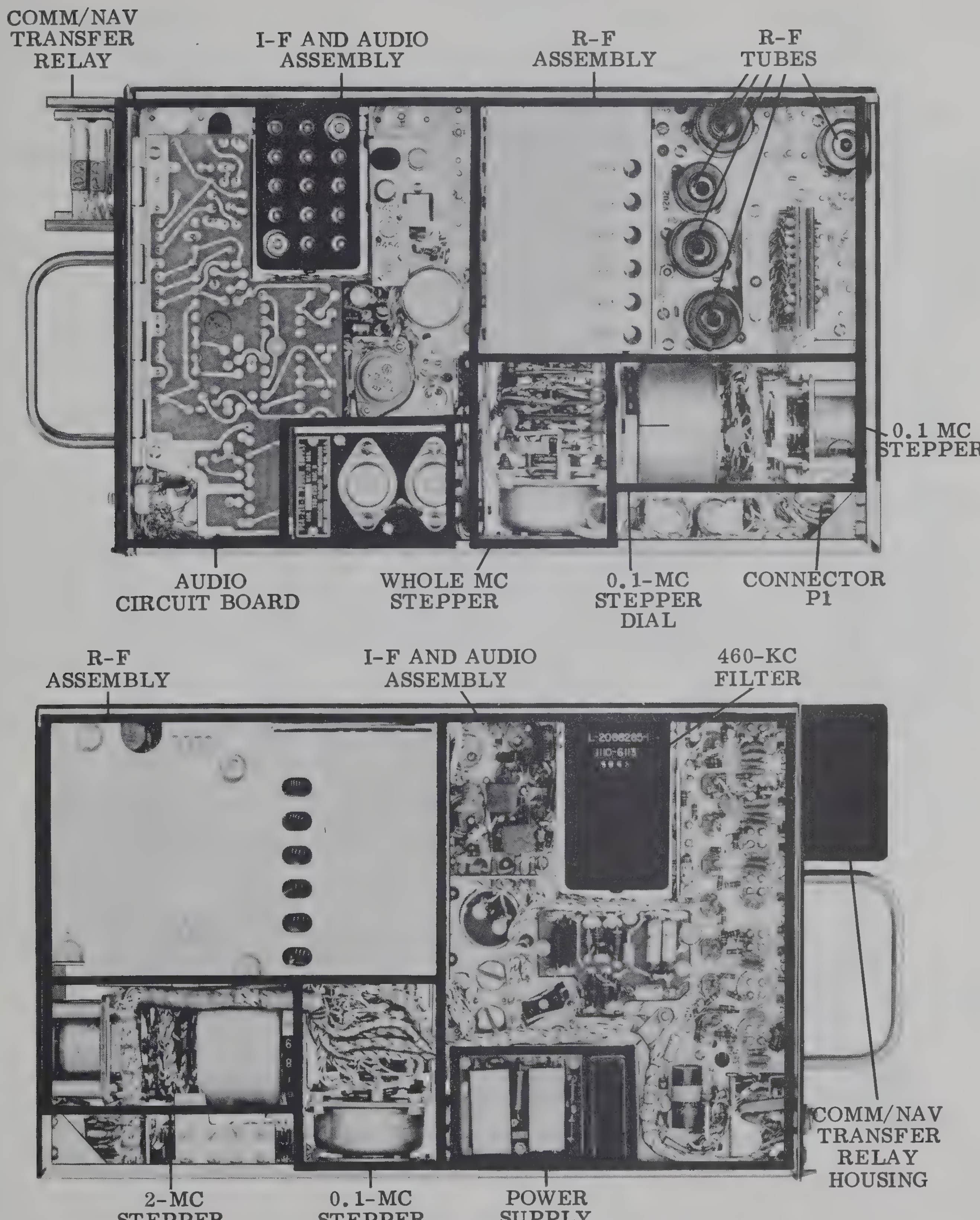

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Figure 4-8. RA-22B VHF Receiver, Details of Construction

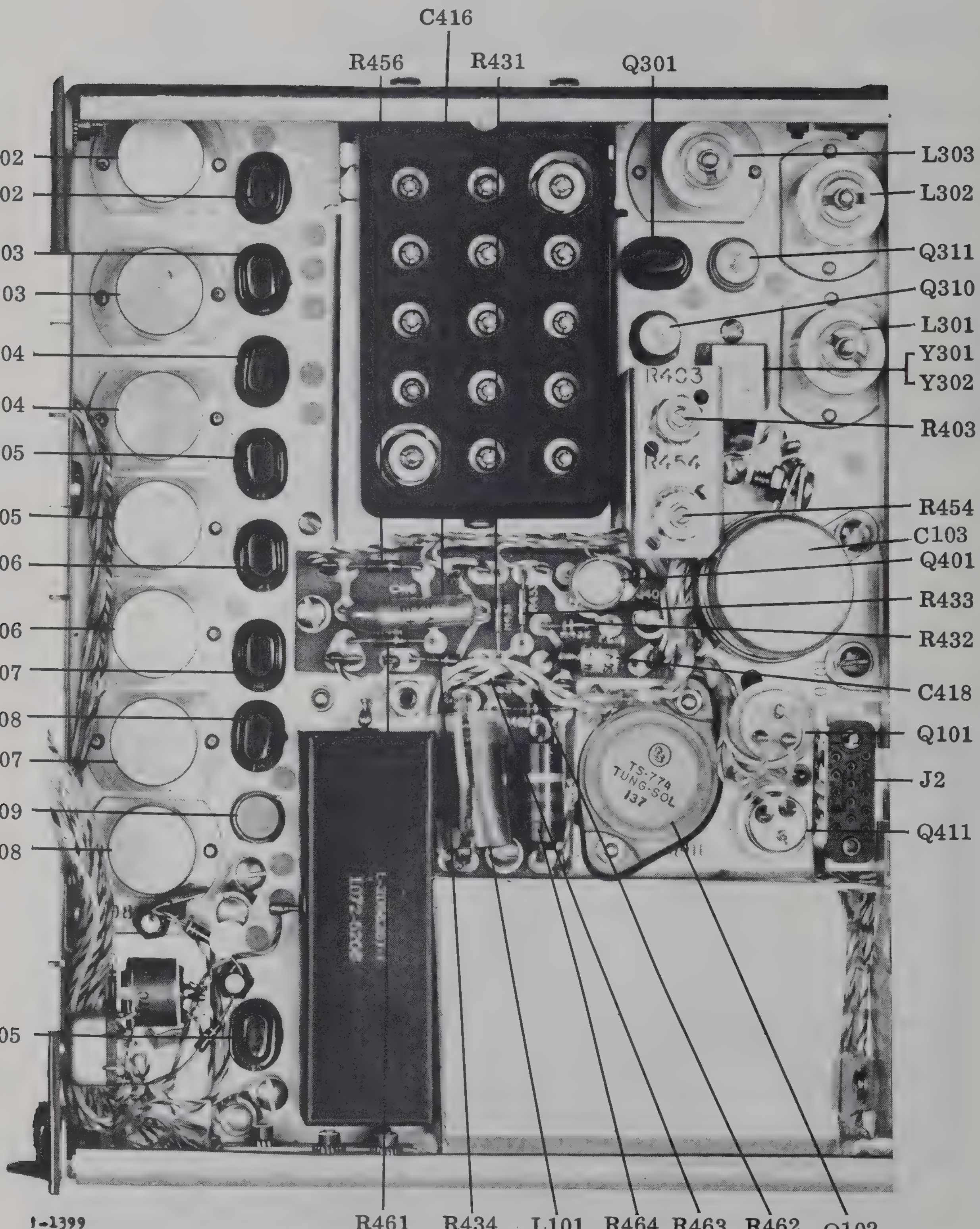

Figure 4-9. Right Side, Front Half, Components

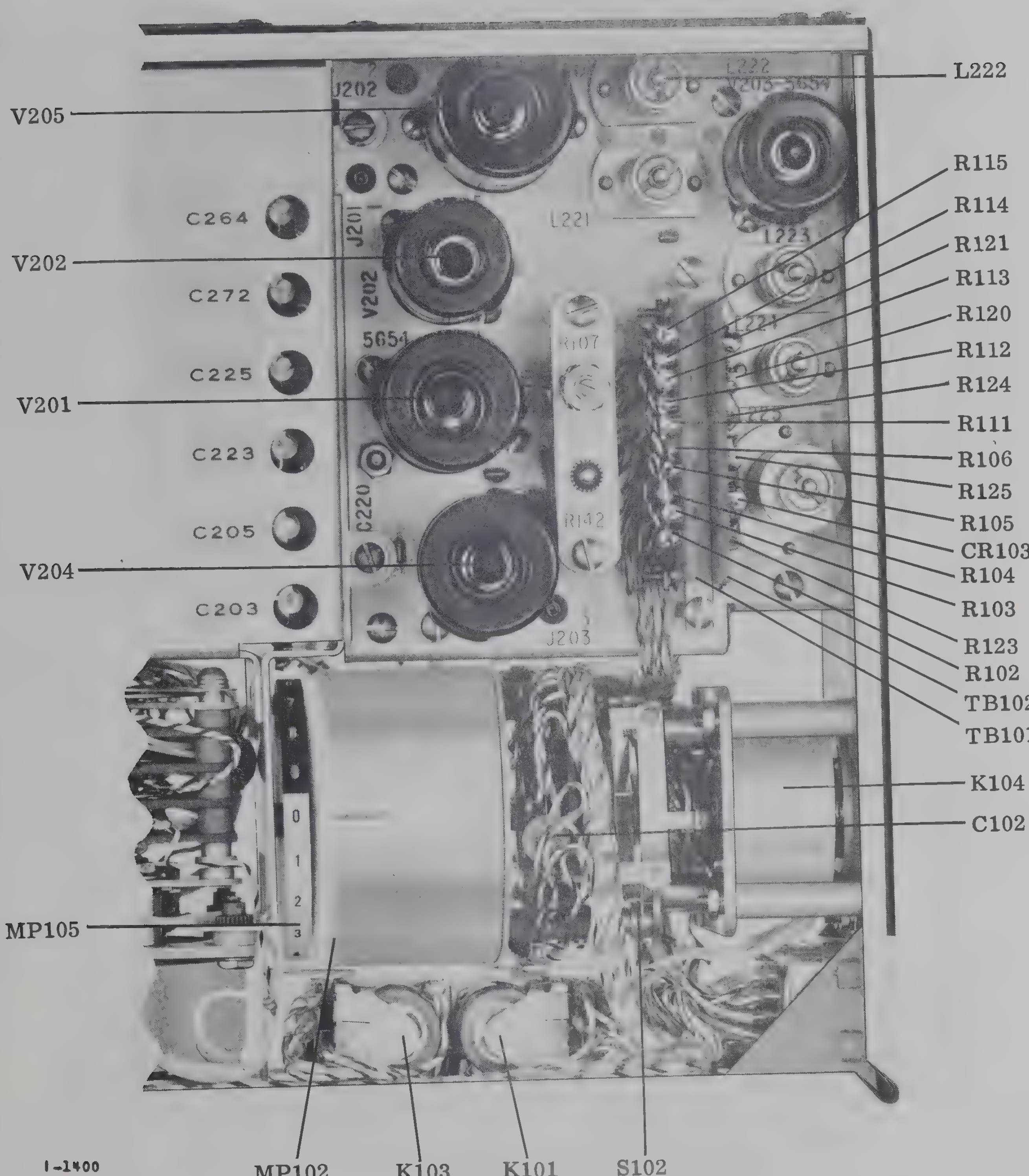

Figure 4-10. Right Side, Rear Half, Components

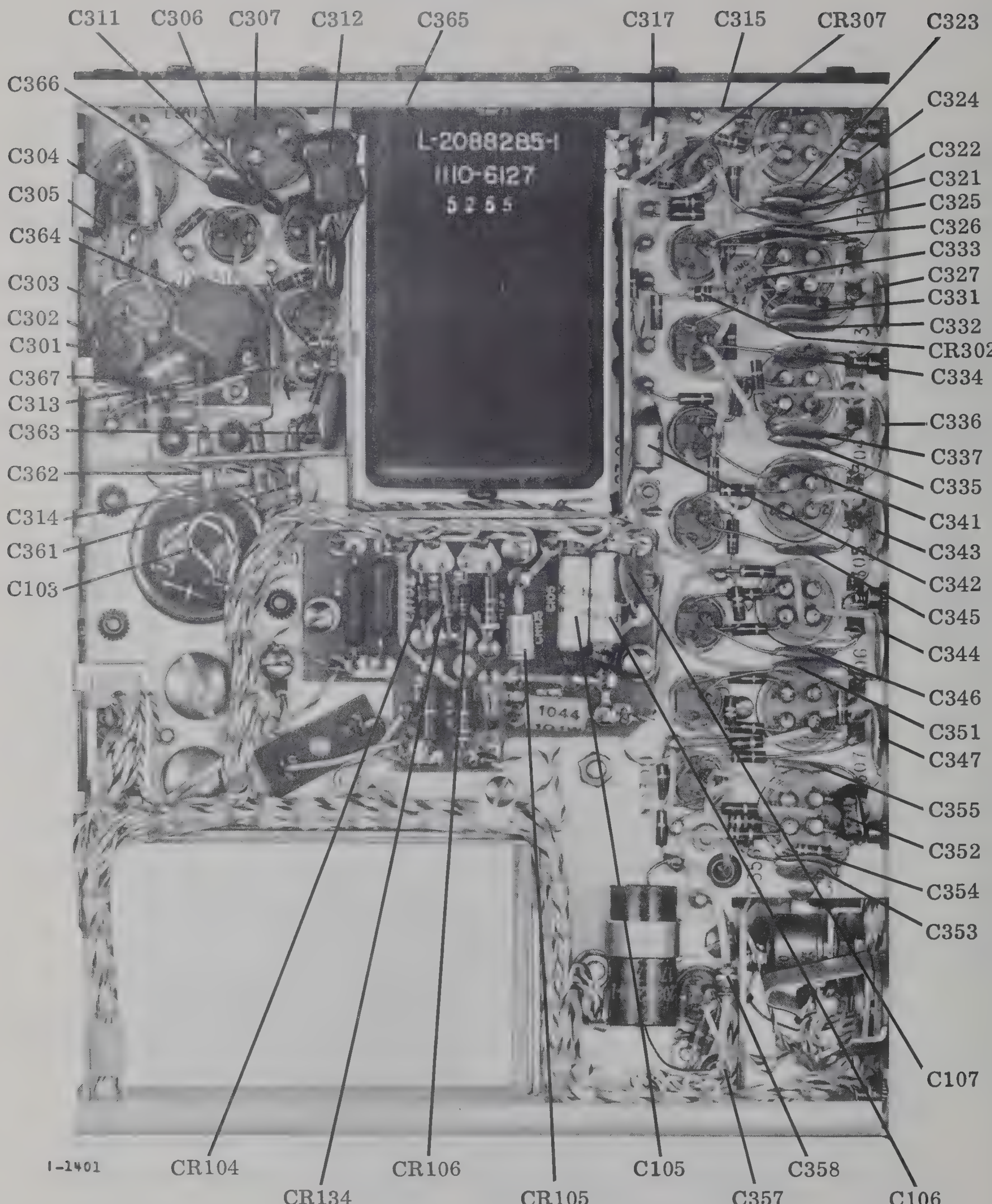

Figure 4-11. Left Side, Front Half, Components '(Sheet 1)

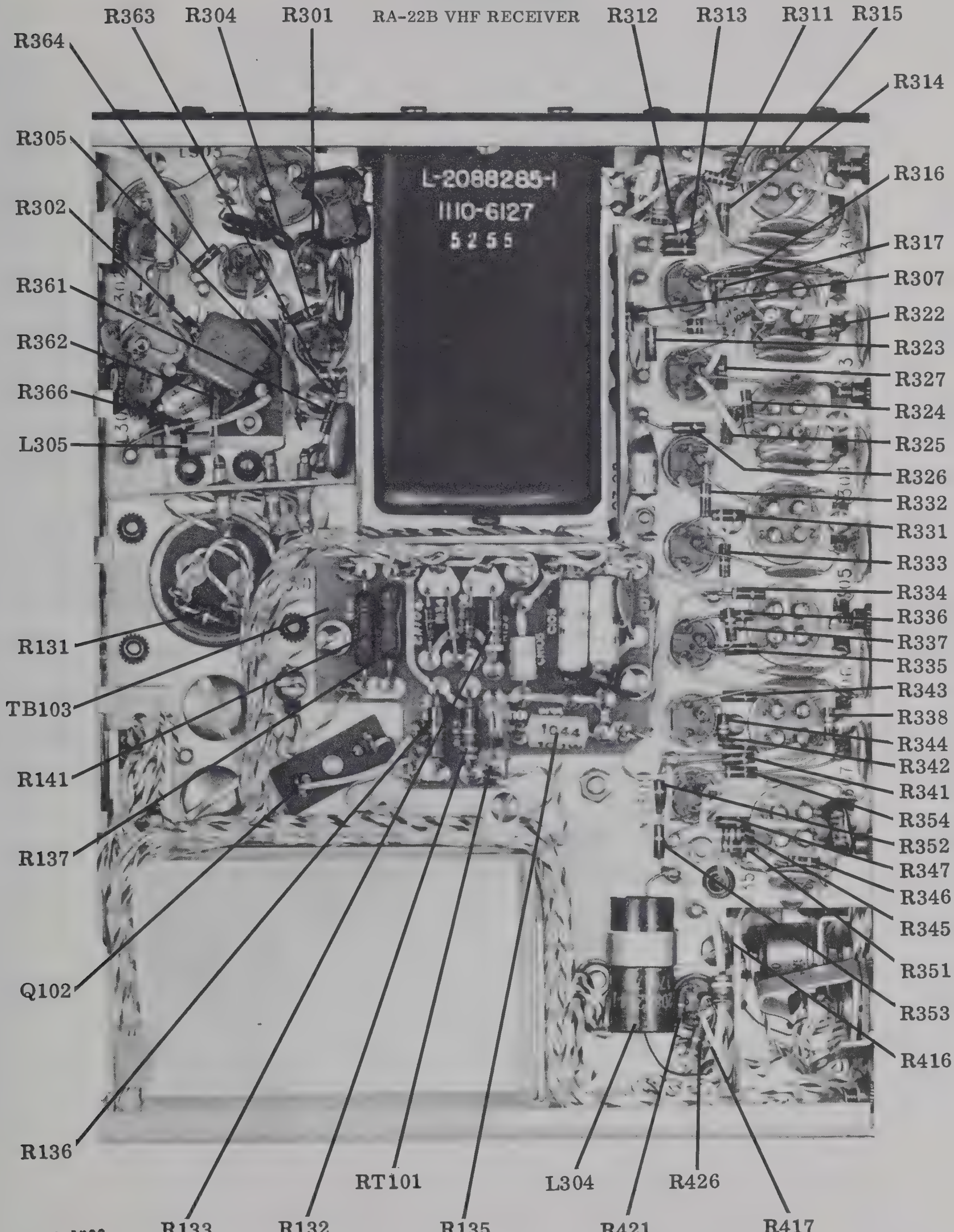

Figure 4-11. Left Side, Front Half, Components (Sheet 2)

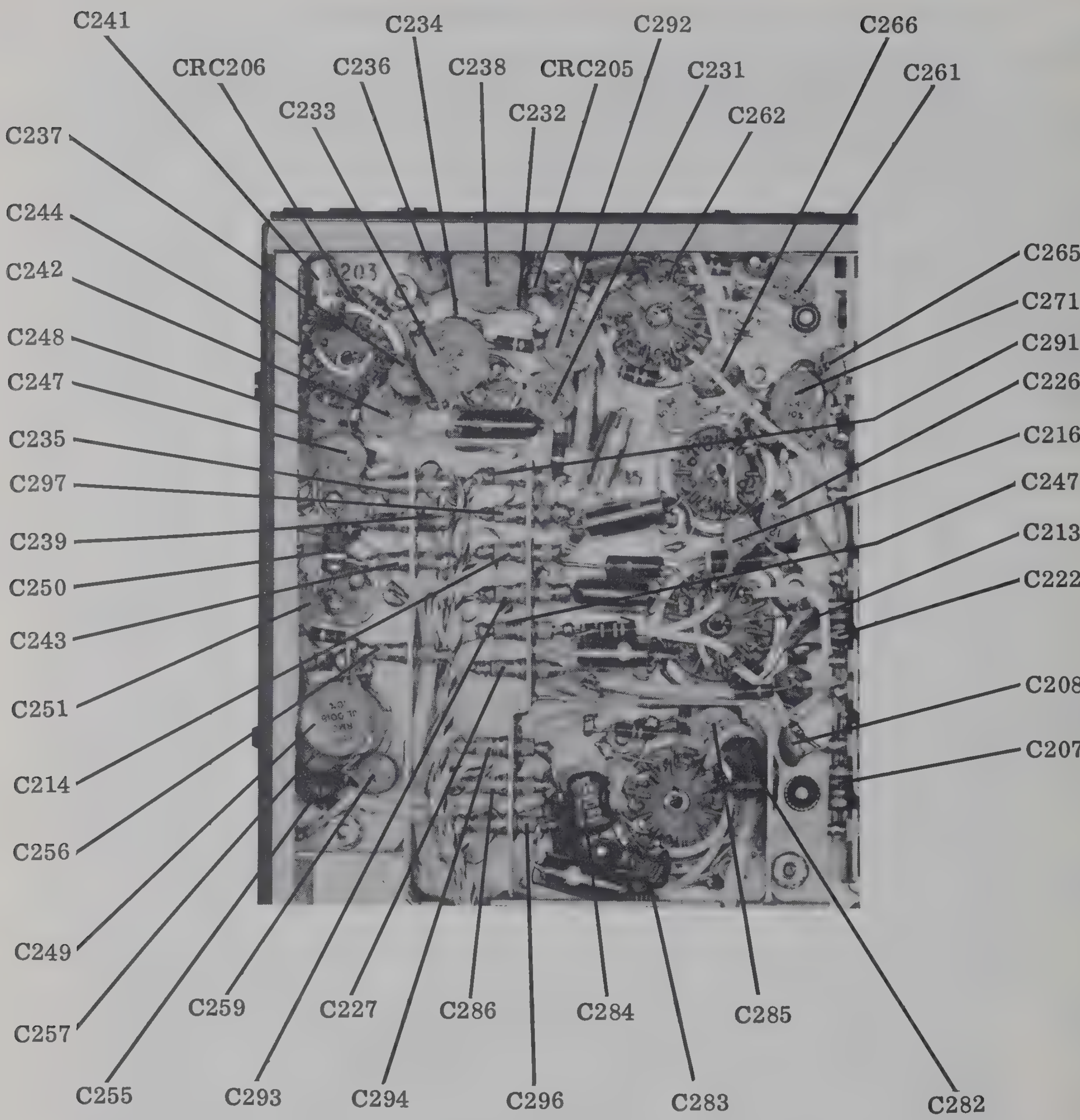

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Figure 4-12. Left Side, Rear Half, Components (Sheet 1)

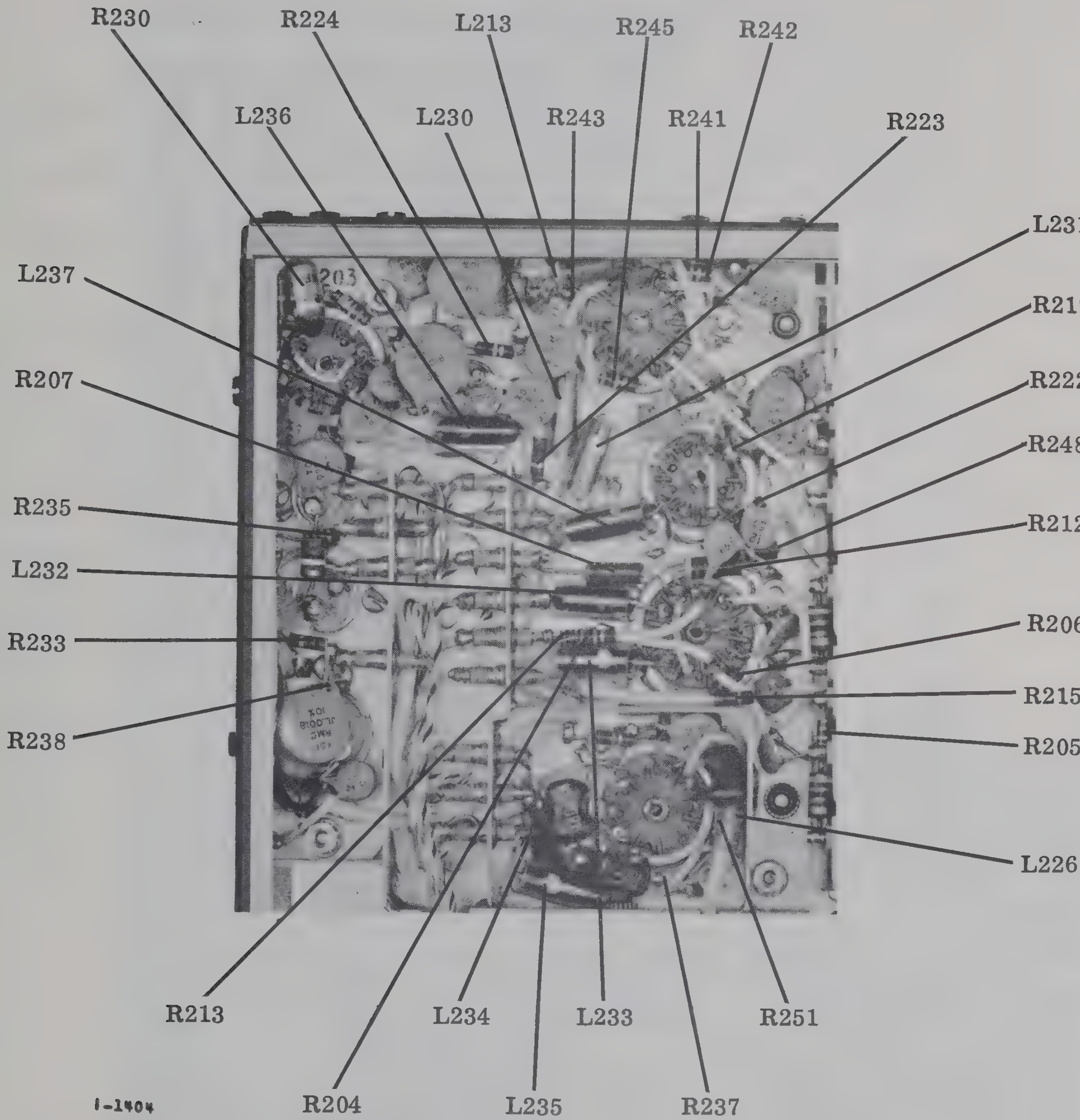

Figure 4-12. Left Side, Rear Half, Components (Sheet 2)

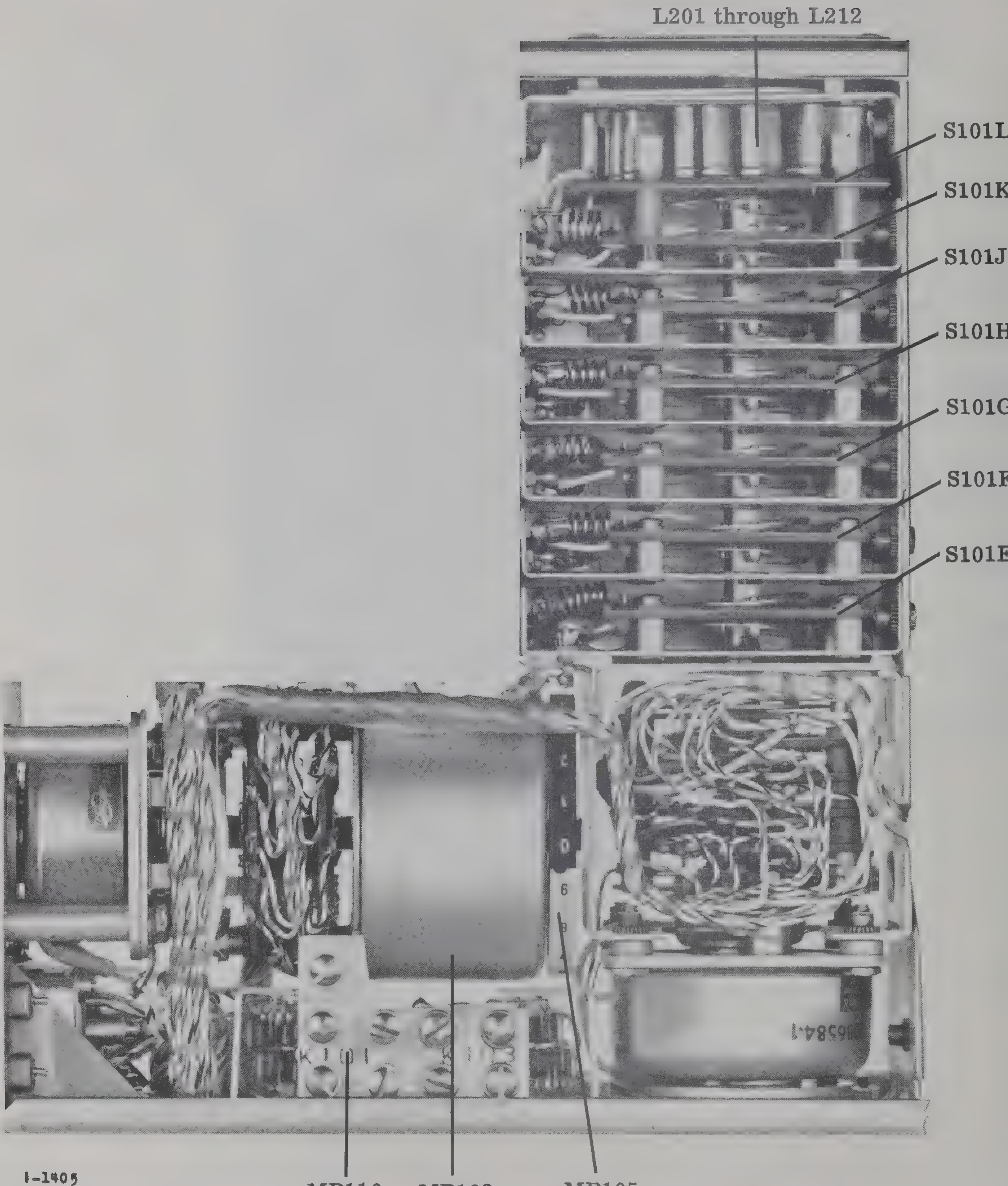

Figure 4-12. Left Side, Rear Half, Components (Sheet 3)

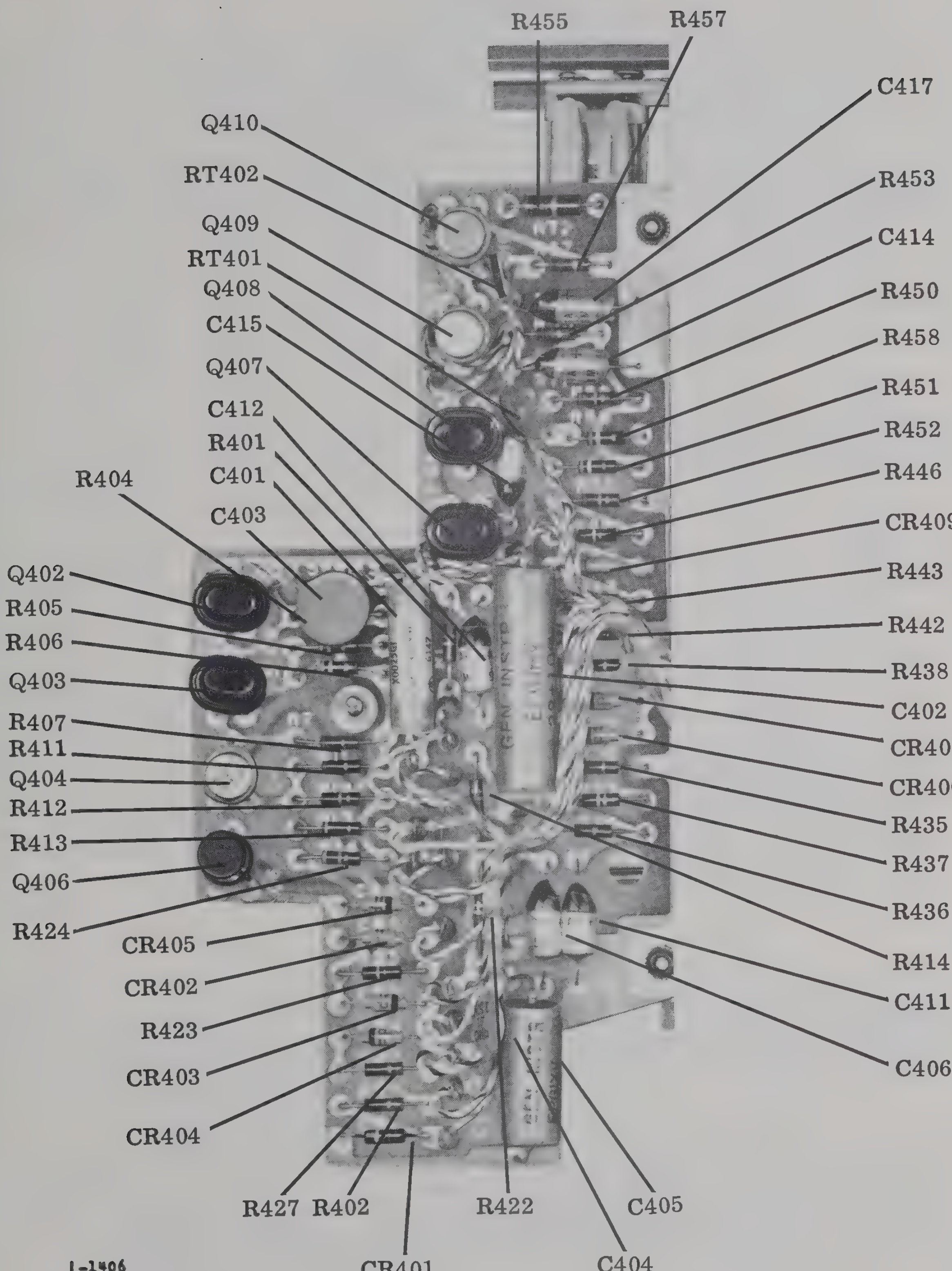

Figure 4-13. I-f and Audio Circuit Board, Components

TABLE 4-10.

RESISTANCE CHECK CHART

Conditions: Rear connector and power supply plugs disconnected.
All resistances are in ohms, unless otherwise specified.
Use multimeter (15).

FROM	TO	RESISTANCE	METER SCALE
J2-A	Gnd	250	X10
J2-B	Gnd	170	X10
J2-D	P1-2	7	X1
J2-D	Gnd	Inf.	X100K
J2-E	Gnd	500	X10
J2-F	Gnd	5	X1
J2-H	Gnd	15	X1
J2-J	Gnd	250	X10
J2-K	Gnd	10	X1
J2-L	Gnd	8	X1
J2-M	P1-28	0	X1
J2-M	Gnd	Inf.	X100K
J2-N	Gnd	10K	X1K
J2-P	Gnd	0	X1
J2-R	P1-26	0	X1
J2-R	Gnd	Inf.	X100K

H. TEST POINT VOLTAGE CHART

Table 4-11 is a test point voltage chart. The REFERENCE column contains the paragraph and step of a particular test where a test point reading is made. The test points are illustrated in the schematic diagram of the receiver in figure 6-1 and are located in figures 4-2 and 4-3.

TABLE 4-11.

TEST POINT VOLTAGE CHART

TEST POINT	VOLTAGE	REFERENCE
TP1	0.55 to 1.00 vac	Par. 4-4.C.5.a, steps (2) and (4) Par. 4-5.D, step (1) Par. 4-5.D, step (1) Par. 4-5.E, step (2) Par. 4-5.F, step (2)
TP2	3.5 vdc, 0.5 to 1.2 vac	
TP3	3.3 vdc, 0.55 to 1.10 vac	Par. 4-4.C.1, step (1) Par. 4-4.C.2, step (1) Par. 4-4.C.3, step (1) Par. 4-4.C.5.b, step (2) Par. 4-5.A, step (2) Par. 4-5.E, step (1)

TABLE 4-11. (Cont'd)

TEST POINT VOLTAGE CHART

TEST POINT	VOLTAGE	REFERENCE
TP5	75 ±3.75 vdc	
TP6	----	Par. 4-4.C.4, step (6)
TP7	----	Par. 4-4.C.4, step (3)
TP8	130 ±6.5 vdc	
TP9	27.5 vdc	
TP10	20 ±1 vdc	
TP11	0.5 vac, 4.1 vdc	
TP12	5.1 vdc	Par. 4-4.C.2, steps (11), (12), and (13)
TP13	5 vdc	
TP14	13.8 vdc	
TP15	0.1 vdc	
TP16	4.4 vac, 11.8 vdc	Par. 4-5.C, step (1) Par. 4-5.F, step (5)

I. STEPPING SWITCH CONTINUITY CHECK CHARTS

Continuity checks are made with the rear connector and power supply plugs disconnected. Figures 4-14 and 4-15 contain continuity check charts for the stepping switches. Use multimeter (item 15 in table 3-1) for the resistance and continuity checks.

ARINC WIRE →	A	B	C	D	J	M	WHOLE MC		A	B	C	D	J	M	← ARINC WIRE
RA-22B PIN →	6	7	8	9	14	17	LO BAND	HI BAND	1	2	7	8	14	15	← CNA-22 PIN
	●	+	●	+	+		108	136	⏚	●	⏚	●		⏚	
	●	+	●	+		+	109	137	⏚	●	⏚	●	⏚		
	●	●	+	●	+		110	138	⏚	⏚		⏚		⏚	
	●	●	+	●		+	111	139	⏚	⏚		⏚	⏚		
	●	●	●	+	+		112	148	⏚	⏚	⏚			⏚	
	●	●	●	+		+	113	149	⏚	⏚	⏚		⏚		
	+	●	●	●	+		114	150		⏚	⏚	⏚		⏚	
	+	●	●	●		+	115	151		⏚	⏚	⏚	⏚		
	+	+	●	●	+		116	142	●	●	⏚	⏚		⏚	
	+	+	●	●		+	117	143	●	●	⏚	⏚	⏚		
	●	+	+	●	+		118	144	⏚	●	●	⏚		⏚	
	●	+	+	●		+	119	145	⏚	●	●	⏚	⏚		
	+		+	+	+		120		●	⏚	●	●		⏚	
	+		+	+		+	121		●	⏚	●	●	⏚		
	+	+		+	+		122		●	●	⏚	●		⏚	
	+	+		+		+	123		●	●	⏚	●	⏚		
	+	+	+		+		124		●	●	●	⏚		⏚	
	+	+	+			+	125		●	●	●	⏚	⏚		
		+	+	+	+		126		⏚	●	●	●		⏚	
		+	+	+		+	127		⏚	●	●	●	⏚		
	●	●	+	+	+		128	146	⏚	⏚	●	●		⏚	
	●	●	+	+		+	129	147	⏚	⏚	●	●	⏚		
	+	●	●	+	+		130	140	●	⏚	⏚	●		⏚	
	+	●	●	+		+	131	141	●	⏚	⏚	●	⏚		
	●	+	●	●	+		132		⏚		⏚	⏚		⏚	
	●	+	●	●		+	133		⏚		⏚	⏚	⏚		
	+	●	+	●	+		134		●	⏚	●	⏚		⏚	
	+	●	+	●		+	135		●	⏚	●	⏚	⏚		

ARINC WIRE N

RA-22B PIN →	20	9	← CNA-22 PIN
LO BAND	⏚	⏚	
HI BAND	+		

NOTE:

⏚ DENOTES THIS PIN GROUNDED.

●●● PINS CONNECTED TOGETHER, BUT NOT GROUNDED.

\+ PIN CONNECTED TO +27.5V THRU APPROPRIATE RELAY.

+++ PINS CONNECTED TOGETHER & CONNECTED TO +27.5 V THRU APPROPRIATE RELAY.

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Figure 4-14. Whole Megacycle Selection, Continuity Check Chart

ARINC WIRE →	E	F	G	H	K	L	FRACT MC	E	F	G	H	K	L	← ARINC WIRE
RA-22B PIN →	10	11	12	13	15	16		4	5	6	10	11	12	← CNA-22 PIN
		+	+	+	+		00	⏚	●	●	●		⏚	
		+	+	+		+	05	⏚	●	●	●	⏚		
	+		+	+	+		10	●	⏚	●	●		⏚	
	+		+	+		+	15	●	⏚	●	●	⏚		
	●	+	●	+	+		20	⏚	●	⏚	●		⏚	
	●	+	●	+		+	25	⏚	●	⏚	●	⏚		
	+	●	+	●	+		30	●	⏚	●	⏚		⏚	
	+	●	+	●		+	35	●	⏚	●	⏚	⏚		
	+	+		+	+		40	●	●	⏚	●		⏚	
	+	+		+		+	45	●	●	⏚	●	⏚		
	●	+	+	●	+		50	⏚	●	●	⏚		⏚	
	●	+	+	●		+	55	⏚	●	●	⏚	⏚		
	●	●	+	+	+		60	⏚	⏚	●	●		⏚	
	●	●	+	+		+	65	⏚	⏚	●	●	⏚		
	+	●	●	+	+		70	●	⏚	⏚	●		⏚	
	+	●	●	+		+	75	●	⏚	⏚	●	⏚		
	+	+	●	●	+		80	●	●	⏚	⏚		⏚	
	+	+	●	●		+	85	●	●	⏚	⏚	⏚		
	+	+	+		+		90	●	●	●	⏚		⏚	
	+	+	+			+	95	●	●	●	⏚	⏚		

NOTE:
- ⏚ DENOTES THIS PIN GROUNDED.
- ● ● ● PINS CONNECTED TOGETHER, BUT NOT GROUNDED.
- + + + PINS CONNECTED TOGETHER & CONNECTED TO +27.5 V THRU APPROPRIATE CONTROL RELAY.

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Figure 4-15. Fractional Megacycle Selection, Continuity Check Chart

4-5. REPAIR

A. GENERAL

The RA-22B is designed so that assemblies and components are easily accessible for repair or replacement. The removable assemblies are attached to the receiver with mounting screws and are easily removed from the receiver chassis. Refer to figure 4-8, which shows the major assemblies of the RA-22B.

B. REPAIR OF STEPPING SWITCHES

1. Repair of Two-megacycle Stepper

Referring to figure 4-16, set whole megacycle dial to 110 - 111 (megacycle) position, then remove two setscrews retaining dial to switch shaft. The dial can then be removed from the shaft end.

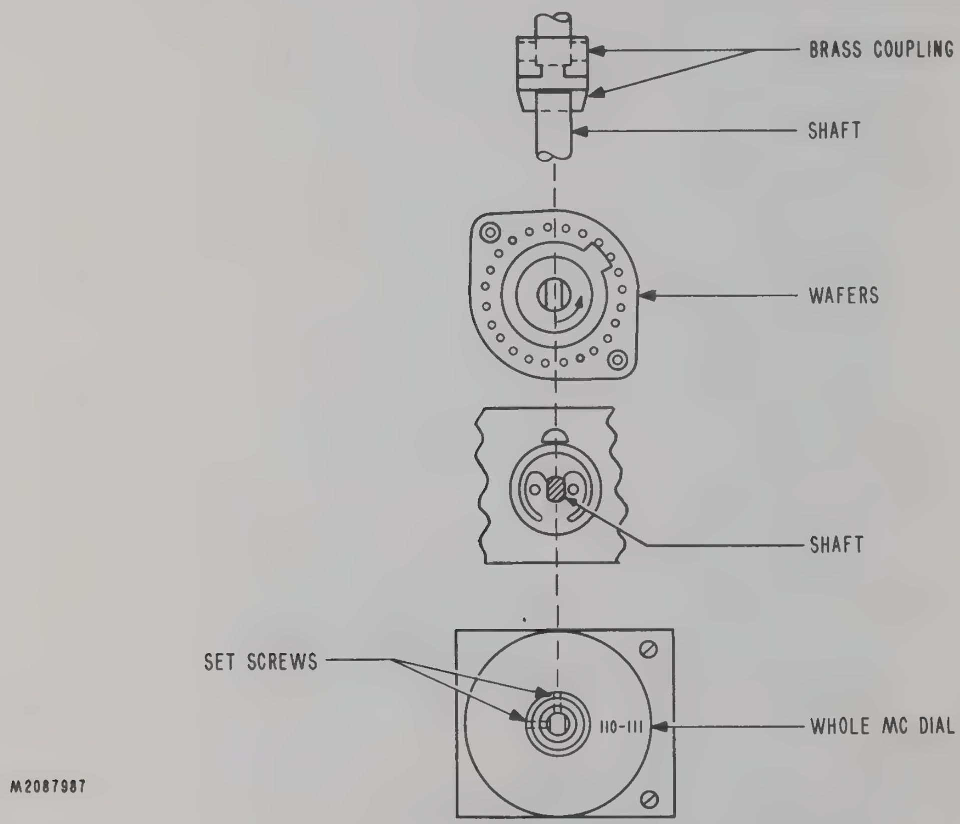
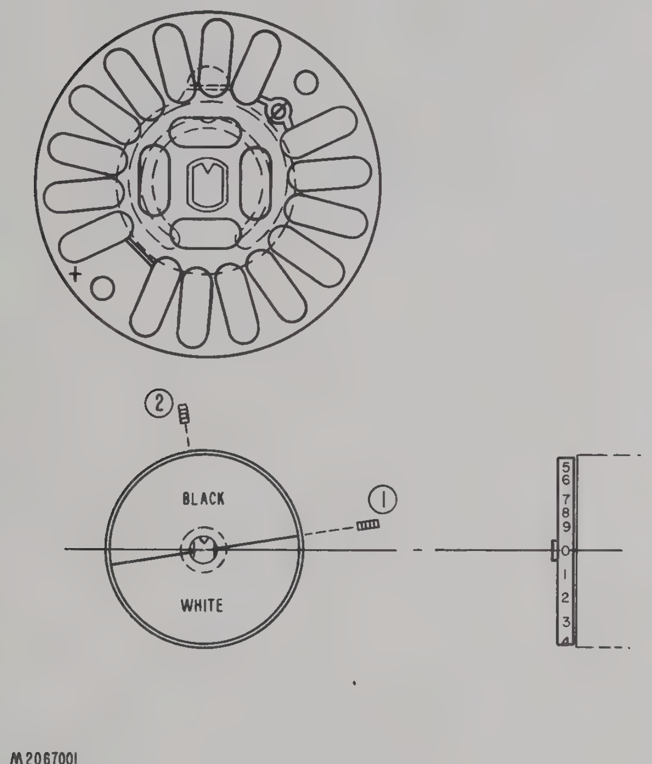


Figure 4-16. Two-megacycle Stepping Switch Disassembly

Grasp shaft end with a pair of long-nose pliers and withdraw shaft just beyond switch wafer board being removed for repair. When replacing wafers and dial, make sure that the switch wafer boards are properly aligned and note correct dial setting (110-111). When the switch is reassembled, always tighten setscrews on flat side of shaft first in order to insure that shaft will not be displaced from proper seating. To remove the stepping mechanism, withdraw shaft end from brass coupling.

2. Tenth-Megacycle Stepper

Referring to figure 4-17, set fractional megacycle dial so that white 0 on black half of dial lines up with black mark on crystal assembly cover; then remove two setscrews that fasten the dial to the switch shaft. The dial then can be removed from shaft end. Grasp shaft end with a pair of long-nose pliers and withdraw shaft just beyond switch wafer board being removed for repair. When replacing shaft, make sure that switch wafers boards and dial are properly aligned, noting correct dial setting as described above. If shaft is completely removed, replace shaft with "v" notch of shaft aligned with rotor pointer on crystal switching board wafer. When shaft or dial is replaced, always tighten setscrews on flat side of shaft or dial hub first so that shaft or dial will not be displaced from proper seating. To remove the stepping mechanism, just withdraw shaft end from brass coupling.



NOTES:

1. ALIGN NOTCH IN SHAFT WITH BUTTON OF ROTOR.
2. ALIGN X MARKS ON WAFERS.
3. BOTH WAFERS SHOWN AS VIEWED FROM SHAFT END, OPPOSITE LEDEX MOTOR.
4. WHEN SECURING DAIL, TIGHTEN SETSCREW (1) FIRST, MAKING CERTAIN IT IS FLAT AGAINST SHAFT. THEN TIGHTEN SETSCREW (2).

Figure 4-17. Tenth-megacycle Stepping Switch Disassembly

C. REPAIR OF OTHER COMPONENTS

Use figures 4-8 through 4-13 to locate replaceable components in the RA-22B. When replacing transistor Q101, apply a thin coating of Dow-Corning DC-4 Silicone Compound to the mounting surface and screw to both sides of the insulating washer. Before replacing transistor Q102, apply a thin coat of Dow-Corning DC-4 Silicone Compound to both sides of the insulator and to the transistor mounting surface.

SECTION V. PARTS LISTS

5-1. GENERAL

This section contains the electrical and mechanical parts lists covering the RA-22B VHF Receiver, as listed below.

ELECTRICAL PARTS LIST

RA-22B VHF RECEIVER

TABLE 5-1.

REFERENCE DESIGNATION	NAME OF PART AND DESCRIPTION	BENDIX PART NUMBER
	CAPACITORS	
C101	1000 μμf ±10%, 1000 vdc, ceramic	L2088016-22
C102	1000 μμf ±10%, 1000 vdc, ceramic	L2088016-22
C103	15/15 μf 200 vdc, type FP, electrolytic	L2088256-1
C104	1000 μμf ±10%, 1000 vdc, ceramic	L2088016-22
C105	30 μf (+75%, -15%), 90 vdc, tantalytic	2088097-26
C106	30 μf (+75%, -15%), 90 vdc, tantalytic	2088097-26
C107	1000 μμf ±10%, 1000 vdc, ceramic	L2088016-22
C108	.005 μf ±10%, 75 vdc, ceramic	L2088497-5
C109	3.5 μf, +50%, -15%, 75 vdc, tantalytic	2088097-10
C110	.05 μf, +80% -20%, 25 vdc, ceramic	2089418-0713
C111 through C200	NOT USED	
C201	3μμf ±0.25 μμf, 1000 vdc, ceramic	L2088016-61
C202	15 μμf ±5%, 1000 vdc, ceramic	L2088016-67
C203	Variable, 1.9-11 μμf	L2088021-1
C204	6 μμf ±5%, 1000 vdc, ceramic	L2088016-59
C205	Variable, 1.9-11 μμf	L2088021-1
C206	6 μμf ±5%, 1000 vdc, ceramic	L2088016-59
C207	.51 μμf ±5%, 500 vdc, ceramic	C220359-13
C208	12 μμf ±5%, 1000 vdc, ceramic	L2088016-32
C209 through C212	NOT USED	
C213	800 μμf ±10%, 1000 vdc, ceramic	L2088016-21
C214	720 μμf ±20%, 500 vdc, ceramic, feedthru	C2088099-4
C215	NOT USED	
C216	150 μμf ±10%, 1000 vdc, ceramic	L2088016-57
C217	720 μμf ±20%, 500 vdc, ceramic, feedthru	C2088099-4
C218	NOT USED	
C219	NOT USED	
C220	220 μμf ±20%, 500 vdc, ceramic, standoff	L2088062-6
C221	6 μμf ±5%, 1000 vdc, ceramic	L2088016-59
C222	.51 μμf ±5%, 500 vdc, ceramic	C220359-13
C223	Variable, 1.9-11 μμf	L2088021-1
C224	6 μμf ±5%, 1000 vdc, ceramic	L2088016-59
C225	Variable, 1.9-11 μμf	L2088021-1
C226	12 μμf ±5%, 1000 vdc, ceramic	L2088016-32
C227	720 μμf ±20%, 500 vdc, ceramic, feedthru	C2088099-4
C228 through C230	NOT USED	

TABLE 5-1

REFERENCE DESIGNATION	NAME OF PART AND DESCRIPTION	BENDIX PART NUMBER
	CAPACITORS (Cont'd)	
C231	800 $\mu\mu$f ±10%, 1000 vdc, ceramic	L2088016-21
C232	4 $\mu\mu$f ±0.25 $\mu\mu$f, 1000 vdc, ceramic	L2088016-25
C233	1800 $\mu\mu$f ±10%, 1000 vdc, ceramic	L2088016-65
C234	1.2 $\mu\mu$f ±5%, 500 vdc, ceramic	C220359-20
C235	720 $\mu\mu$f ±20%, 500 vdc, ceramic, feedthru	C2088099-4
C236	800 $\mu\mu$f ±10%, 1000 vdc, ceramic	L2088016-21
C237	3 $\mu\mu$f ±0.25 $\mu\mu$f, 1000 vdc, ceramic	L2088016-61
C238	1800 $\mu\mu$f ±10%, 1000 vdc, ceramic	L2088016-65
C239	720 $\mu\mu$f ±20%, 500 vdc, ceramic, feedthru	C2088099-4
C240	NOT USED	
C241	2 μf (+50%, -15%) 90 vdc, tantalytic	2088097-11
C242	800 $\mu\mu$f ±10%, 1000 vdc, ceramic	L2088016-21
C243	720 $\mu\mu$f ±20%, 500 vdc, ceramic, feedthru	C2088099-4
C244	800 $\mu\mu$f ±10%, 1000 vdc, ceramic	L2088016-21
C245	NOT USED	
C246	NOT USED	
C247	800 $\mu\mu$f ±10%, 1000 vdc, ceramic	L2088016-21
C248	5 $\mu\mu$f ±5%, 1000 vdc, ceramic	L2088016-26
C249	1800 $\mu\mu$f ±10%, 1000 vdc, ceramic	L2088016-65
C250	1.2 $\mu\mu$f ±5%, 500 vdc, ceramic	C220359-20
C251	800 $\mu\mu$f ±10%, 1000 vdc, ceramic	L2088016-21
C252 through C254	NOT USED	
C255	10 $\mu\mu$f ±5%, N750, 1000 vdc, ceramic	L2088016-19
C256	720 $\mu\mu$f ±20%, 500 vdc, ceramic, feedthru	C2088099-4
C257	110 $\mu\mu$f ±2%, 500 vdc, mica	L2088000-227
C258	800 $\mu\mu$f ±10%, 1000 vdc, ceramic	L2088016-21
C259	5 $\mu\mu$f ±5%, 1000 vdc, ceramic	L2088016-26
C260	NOT USED	
C261	800 $\mu\mu$f ±10%, 1000 vdc, ceramic	L2088016-21
C262	33 $\mu\mu$f ±5%, N750, 1000 vdc, ceramic	L2088016-70
C263	100 $\mu\mu$f ±5%, 500 vdc, mica	L2088000-431
C264	Variable, 1.9-11 $\mu\mu$f	L2088021-1
C265	7 $\mu\mu$f ±0.25 $\mu\mu$f, 1000 vdc, ceramic	L2088016-26
C266	22 $\mu\mu$f ±10%, 1000 vdc, ceramic	L2088016-58
C267	470 $\mu\mu$f ±10%, 1000 vdc, ceramic	L2088016-36
C268 through C270	NOT USED	

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TABLE 5-1

REFERENCE DESIGNATION	NAME OF PART AND DESCRIPTION	BENDIX PART NUMBER
	CAPACITORS (Cont'd)	
C271	800 $\mu\mu$f ±10%, 1000 vdc, ceramic	L2088016-21
C272	Variable, 1.9-11 $\mu\mu$f	L2088021-1
C273	5 $\mu\mu$f ±5%, 1000 vdc, ceramic	L2088016-26
C274	24 $\mu\mu$f ±5%, 1000 vdc, ceramic	L2088016-58
C275 through C281	NOT USED	
C282	24 $\mu\mu$f ±2%, 500 vdc, mica	L2088000-229
C283	100 $\mu\mu$f ±5%, 500 vdc, mica	L2088000-431
C284	180 $\mu\mu$f ±5%, 500 vdc, mica	L2088000-433
C285	800 $\mu\mu$f ±10%, 1000 vdc, ceramic	L2088016-21
C286	720 $\mu\mu$f ±20%, 500 vdc, ceramic, feedthru	C2088099-4
C287 through C290	NOT USED	
C291	720 $\mu\mu$f ±20%, 500 vdc, ceramic, feedthru	C2088099-4
C292	1000 $\mu\mu$f ±10%, 1000 vdc, ceramic	L2088016-22
C293	720 $\mu\mu$f ±20%, 500 vdc, ceramic, feedthru	C2088099-4
C294	720 $\mu\mu$f ±20%, 500 vdc, ceramic, feedthru	C2088099-4
C295	NOT USED	
C296	720 $\mu\mu$f ±20%, 500 vdc, ceramic, feedthru	C2088099-4
C297	720 $\mu\mu$f ±20%, 500 vdc, ceramic, feedthru	C2088099-4
C298 through C300	NOT USED	
C301	10 $\mu\mu$f ±5%, N750, 1000 vdc, ceramic	L2088016-19
C302	100 $\mu\mu$f ±5%, 500 vdc, mica	L2088000-431
C303	5 $\mu\mu$f ±5%, 1000 vdc, ceramic	L2088016-26
C304	10 $\mu\mu$f ±5%, N750, 1000 vdc, ceramic	L2088016-19
C305	120 $\mu\mu$f ±2%, 500 vdc, mica	L2088000-207
C306	5 $\mu\mu$f ±5%, 1000 vdc, ceramic	L2088016-26
C307	10 $\mu\mu$f ±5%, N750, 1000 vdc, ceramic	L2088016-19
C308 through C310	NOT USED	
C311	130 $\mu\mu$f ±5%, 500 vdc, mica	L2088000-415
C312	1200 $\mu\mu$f ±5%, 500 vdc, mica	L2088000-438
C313	0.01 μf (+150%, -0%) 100 vdc, ceramic	L2088856-1
C314	720 $\mu\mu$f ±20%, 500 vdc, ceramic, feedthru	C2088099-4
C315	0.01 μf (+150%, -0%) 100 vdc, ceramic	L2088856-1
C316	0.01 μf (+150%, -0%) 100 vdc, ceramic	L2088856-1

TABLE 5-1

REFERENCE DESIGNATION	NAME OF PART AND DESCRIPTION	BENDIX PART NUMBER
	CAPACITORS (Cont'd)	
C317	8 μμf (+50%, -15%) 30 vdc, tantalytic	2088097-2
C318 through C320	NOT USED	
C321	0.01 μf (+150%, -0%) 100 vdc, ceramic	L2088856-1
C322	0.01 μf (+150%, -0%) 100 vdc, ceramic	L2088856-1
C323	0.01 μf (+150%, -0%) 100 vdc, ceramic	L2088856-1
C324	0.01 μf (+150%, -0%) 100 vdc, ceramic	L2088856-1
C325	0.01 μf (+150%, -0%) 100 vdc, ceramic	L2088856-1
C326	0.01 μf (+150%, -0%) 100 vdc, ceramic	L2088856-1
C327	0.01 μf (+150%, -0%) 100 vdc, ceramic	L2088856-1
C328 through C330	NOT USED	
C331	0.01 μf (+150%, -0%) 100 vdc, ceramic	L2088856-1
C332	0.01 μf (+150%, -0%) 100 vdc, ceramic	L2088856-1
C333	470 μμf ±10%, 1000 vdc, ceramic	L2088016-24
C334	0.01 μf (+150%, -0%) 100 vdc, ceramic	L2088856-1
C335	0.01 μf (+150%, -0%) 100 vdc, ceramic	L2088856-1
C336	0.01 μf (+150%, -0%) 100 vdc, ceramic	L2088856-1
C337	0.01 μf (+150%, -0%) 100 vdc, ceramic	L2088856-1
C338 through C340	NOT USED	
C341	0.01 μf (+150%, -0%) 100 vdc, ceramic	L2088856-1
C342	8 μf (+50%, -15%) 30 vdc, tantalytic	2088097-2
C343	.01 μf (+150%, -0%) 100 vdc, ceramic	L2088856-1
C344	.01 μf (+150%, -0%) 100 vdc, ceramic	L2088856-1
C345	.01 μf (+150%, -0%) 100 vdc, ceramic	L2088856-1
C346	.01 μf (+150%, -0%) 100 vdc, ceramic	L2088856-1
C347	.01 μf (+150%, -0%) 100 vdc, ceramic	L2088856-1
C348 through C350	NOT USED	
C351	.01 μf (+150%, -0%) 100 vdc, ceramic	L2088856-1
C352	47 μμf ±2%, 500 vdc, mica	L2088000-214
C353	.01 μf (+150%, -0%) 100 vdc, ceramic	L2088856-1
C354	.01 μf (+150%, -0%) 100 vdc, ceramic	L2088856-1
C355	.01 μf (+150%, -0%) 100 vdc, ceramic	L2088856-1
C356	.0033 μf ±5%, 400 vdc, vitamin Q	L220380-14
C357	.0033 μf ±5%, 400 vdc, vitamin Q	L220380-14

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TABLE 5-1.

REFERENCE DESIGNATION	NAME OF PART AND DESCRIPTION	BENDIX PART NUMBER
	CAPACITORS (Cont'd.)	
C358	6.8 μμf ±5%, 500 vdc, ceramic	C220359-16
C359	NOT USED	
C360	NOT USED	
C361	720 μμf ±20%, 500 vdc, ceramic, feedthru	C2088099-4
C362	720 μμf ±20%, 500 vdc, ceramic, feedthru	C2088099-4
C363	0.1 μf (+100%, -20%) 30 vdc, ceramic	L2088358-2
C364	0.1 μf (+100%, -20%) 30 vdc, ceramic	L2088358-2
C365	27 μμf ±2%, 500 vdc, mica	L2088000-224
C366	27 μμf ±2%, 500 vdc, mica	L2088000-224
C367	2 μf (+50%, -15%) 90 vdc, tantalytic	2088097-11
C368	.05 μf, +80%, -20%, 25 vdc, ceramic	2089418-0713
C369 through C400	NOT USED	
C401	6 μf ±20%, 25 vdc, tantalytic	L2088234-4
C402	0.33 μf ±10%, 100 vdc, vitamin Q	L2088243-39
C403	.05 μf (+150%, -0%) 250 vdc, ceramic	L2088275-2
C404	.01 μf (+150%, -0%) 100 vdc, ceramic	L2088856-1
C405	0.1 μf ±5%, 100 vdc, vitamin Q	L2088243-29
C406	5 μf (+50%, -15%) 50 vdc, tantalytic	2088097-8
C407	470 μμf ±10%, 1000 vdc, ceramic	L2088016-24
C408 through C410	NOT USED	
C411	2 μf (+50%, -15%) 90 vdc, tantalytic	2088097-11
C412	2 μf (+50%, -15%) 90 vdc, tantalytic	2088097-11
C413	.01 μf (+150%, -0%) 100 vdc, ceramic	2088856-1
C414	8 μf (+50%, -15%) 30 vdc, tantalytic	2088097-2
C415	2 μf (+50%, -15%) 90 vdc, tantalytic	2088097-11
C416	100 μf (+50%, -15%) 30 vdc, tantalytic	2088097-23
C417	8 μf (+50%, -15%) 30 vdc, tantalytic	2088097-2
C418	5 μf (+50%, -15%) 50 vdc, tantalytic	2088097-8
C419	NOT USED	
C420	10 μf ±20%, 20 vdc, tantalytic	2088355-29
	SEMICONDUCTOR DIODES	
CR101	1N645, silicon, 225 PIV	L2088156-1
CR102	1N645, silicon, 225 PIV	L2088156-1
CR103	1N1792A, silicon, Zener, 75v ±5%	L2088510-2
CR104	1N717A, silicon, Zener, 13v ±5%	2088511-1
CR105	1N2612, silicon, 300 PIV	2088787-3
CR106	1N754A, silicon, Zener, 6.8v ±5%	2088809-18

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TABLE 5-1

REFERENCE DESIGNATION	NAME OF PART AND DESCRIPTION	BENDIX PART NUMBER
	SEMICONDUCTOR DIODES (Cont'd)	
CR107 through CR300	NOT USED	
CR301	PS5062, silicon, 9PIV	L291664-9
CR302	PS5062, silicon, 9PIV	L291664-9
CR303 through CR400	NOT USED	
CR401	SV575 or PS6129, silicon, Zener, 8v ±5%	L2088293-8
CR402	1N461, silicon, 25 PIV	L291664-5
CR403	PS5062, silicon, 9 PIV	L291664-9
CR404	PS5062, silicon, 9 PIV	L291664-9
CR405	PS5062, silicon, 9 PIV	L291664-9
CR406	PS5062, silicon, 9 PIV	L291664-9
CR407	PS5062, silicon, 9 PIV	L291664-9
CR408	1N461, silicon, 25 PIV	L291664-5
CR409	1N461, silicon, 25 PIV	L291664-5
CRC100 through CRC200	NOT USED	
CRC201	Varicap, 20 $\mu\mu f$ ±10% at 4 vdc, 70 mwv	2088800-1
CRC202	Varicap, 20 $\mu\mu f$ ±10% at 4 vdc, 70 mwv	2088800-1
CRC203	Varicap, 20 $\mu\mu f$ ±10% at 4 vdc, 70 mwv	2088800-1
CRC204	Varicap, 20 $\mu\mu f$ ±10% at 4 vdc, 70 mwv	2088800-1
CRC205	Varicap, 56 $\mu\mu f$ ±10% at 4 vdc, 40 mwv	2088800-2
CRC206	Varicap, 56 $\mu\mu f$ ±10% at 4 vdc, 40 mwv	2088800-2
CRC207	Varicap, 56 $\mu\mu f$ ±10% at 4 vdc, 40 mwv	2088800-2
CRC208	Varicap, 56 $\mu\mu f$ ±10% at 4 vdc, 40 mwv	2088800-2
	TUBE SHIELDS	
E100 through E200	NOT USED	
E201	Tube shield	L2088053-8
E202	Tube shield	L2088053-7
E203	Tube shield	L2088053-7
E204	Tube shield	L2088053-8
E205	Tube shield	L2088053-8
E206	Insert in tube shield	C2088005-8
E207	Insert in tube shield	C2088005-7

TABLE 5-1

REFERENCE DESIGNATION	NAME OF PART AND DESCRIPTION	BENDIX PART NUMBER
	TUBE SHIELDS (Cont'd)	
E208	Insert in tube shield	C2088005-7
E209	Insert in tube shield	C2088005-8
E210	Insert in tube shield	C2088005-8
E211	Tube shield mount	C2088087-1
E212	Tube shield mount	C2088085-1
E213	Tube shield mount	C2088085-1
E214	Tube shield mount	C2088087-1
E215	Tube shield mount	C2088087-1
	FILTERS	
FL100 through FL300	NOT USED	
FL301	Coil assembly, 460 kc BV-40 KC	L2088285-1
FL302 through FL400	NOT USED	
FL401	Climax filter	C2088287-1
	CONNECTORS	
J1	Telephone receptacle	JJ034
J2	14-pin female connector	L2088118-1
J3 through J200	NOT USED	
J201	Test jack	L2088147-2
J202	Test jack	L2088147-2
J203	Test jack	L2088147-2
	RELAYS	
K101	300 ohms, 28 vdc, 1 Form A, 2 Form B	N2088154-24
K102	Stepping, No. 5S Ledex, 28 v coil	2086584-1
K103	300 ohms, 28 vdc, 1 Form A, 2 Form B	N2088154-24
K104	Stepping, No. 4E Ledex, 28v coil	2086585-1
K105	300 ohms, 28 vdc, 1 Form A, 1 Form B, 2 Form C	2088656-4
	INDUCTORS	
L101	45 μh	2088776-1
L102 through L200	NOT USED	
L201	Variable, air coil	2082810-3
L202	Variable, printed, 24 pos. switch	2086756-1

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TABLE 5-1

REFERENCE DESIGNATION	NAME OF PART AND DESCRIPTION	BENDIX PART NUMBER
L203	Variable, air core	2082810-1
L204	Variable, printed, 24 pos. switch	2086756-1
L205	Variable, air core	2082810-4
L206	Variable, printed, 24 pos. switch	2086756-1
L207	Variable, air core	2082810-1
L208	Variable, printed, 24 pos. switch	2086756-1
L209	Variable, air core	2082810-5
L210	Variable, printed, 24 pos. switch	2086712-1
L211	Variable, air core	2082810-1
L212	Variable, printed, 24 pos. switch	2086713-1
L213	0.4 μh ±10%	L2088300-23
L214 through L220	NOT USED	
L221	Variable, iron core	2086654-1
L222	Variable, iron core	2086654-1
L223	Variable, iron core	2086654-1
L224	Variable, iron core	2086654-1
L225	Variable, iron core	2086653-1
L226	4.7 μh ±10%	L2088300-13
L227	1.2 μh ±10%	L2088300-75
L228	NOT USED	
L229	NOT USED	
L230	6 μh	C215350-4
L231	6 μh	C215350-4
L232	6 μh	C215350-4
L233	6 μh	C215350-4
L234	6 μh	C215350-4
L235	6 μh	C215350-4
L236	6 μh	C215350-4
L237	6 μh	C215350-4
L238 through L300	NOT USED	
L301	Variable, iron core	2086653-1
L302	Variable, iron core	2086653-1
L303	Variable, iron core	2086653-1
L304	10 μh ±7.5% at 1000 cps, 50 ohms dc	L2088284-1
L305	14 μh ±10%	L220663-7

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TABLE 5-1

REFERENCE DESIGNATION	NAME OF PART AND DESCRIPTION	BENDIX PART NUMBER
	PLUGS	
P1	29-pin male connector	N2088112-7
	TRANSISTORS	
Q101	2N657, NPN	N2088262-26
Q102	Tungsol TS774, PNP	N2088276-7
Q103 through Q300	NOT USED	
Q301	4JX2A832, NPN	N2088265-3
Q302	4JX2A806, NPN	N2088265-2
Q303	2N169A, NPN	N2088265-1
Q304	4JX2A806, NPN	N2088265-2
Q305	2N169A, NPN	N2088265-1
Q306	2N169A, NPN	N2088265-1
Q307	2N169A, NPN	N2088265-1
Q308	2N169A, NPN	N2088265-1
Q309	2N377A, NPN	N2088262-22
Q310	2N440, NPN	N2088262-3
Q311	2N440, NPN	N2088262-3
Q312 through Q400	NOT USED	
Q401	2N525, PNP	N2088262-2
Q402	4JX2A806, NPN	N2088265-2
Q403	4JX2A806, NPN	N2088265-2
Q404	CK919, PNP	N2088262-1
Q405	2N169A, NPN	N2088265-1
Q406	2N333, NPN	N2088262-7
Q407	4JX2A806, NPN	N2088265-2
Q408	4JX2A832, NPN	N2088265-3
Q409	2N525, PNP	N2088262-2
Q410	2N525, PNP	N2088262-2
Q411	2N158, PNP	N2088266-1
	RESISTORS	
R101	1800 ohms ±10%, 1/4w, composition	RC07GF182K
R102	6810 ohms ±1%, 1/4w, carbon film	2088797-1
R103	8250 ohms ±1%, 1/4w, carbon film	2088797-2
R104	9090 ohms ±1%, 1/4w, carbon film	2088797-3
R105	11K ±1%, 1/4w, carbon film	2088797-4
R106	12.4 ±1%, 1/4w, carbon film	2088797-6

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TABLE 5-1

REFERENCE DESIGNATION	NAME OF PART AND DESCRIPTION	BENDIX PART NUMBER
	RESISTORS (Cont'd)	
R107	5000 ohms ±20%, 1/3w, potentiometer, U-taper	N2088181-5
R108 through R110	NOT USED	
R111	14.3K ±1%, 1/4w, carbon film	2088797-7
R112	16.5K ±1%, 1/4w, carbon film	2088797-8
R113	18.7K ±1%, 1/4w, carbon film	2088797-9
R114	21.5K ±1%, 1/4w, carbon film	2088797-10
R115	25.5K ±1%, 1/4w, carbon film	2088797-11
R116 through R119	NOT USED	
R120	16.5K ±1%, 1/4w, carbon film	2088797-8
R121	42.2K ±1%, 1/4w, carbon film	2088797-13
R122	NOT USED	
R123	43.2K ±1%, 1/4w, carbon film	2088797-14
R124	30.1K ±1%, 1/4w, carbon film	2088797-12
R125	6800 ohms ±1%, 3w, wirewound	L2088408-9
R126 through R130	NOT USED	
R131	100 ohms ±10%, 1/2w, composition	RC20GF101K
R132	300 ohms ±5%, 1/2w, composition	RC20GF331J
R133	470 ohms ±5%, 1/2w, composition	RC20GF471J
R134	3300 ohms ±5%, 1/4w, composition	RC07GF332J
R135	1 ohm ±5%, 1w, wirewound	L2088067-1
R136	15 ohms ±5%, 1/2w, composition	RC20GF150J
R137	700 ohms ±3%, 3w, wirewound	L2088408-8
R138 through R140	NOT USED	
R141	300 ohms ±3%, 3w, wirewound	L2088408-7
R142	5.6 ohms ±5%, 2w, wirewound	L2088257-3
R143 through R200	NOT USED	
R201	100K ±10%, 1/4w, composition	RC07GF104K
R202	100K ±10%, 1/4w, composition	RC07GF104K
R203	NOT USED	
R204	470K ±10%, 1/4w, composition	RC07GF474K
R205	15K ±10%, 1/4w, composition	RC07GF153K
R206	1000 ohms ±10%, 1/4w, composition	RC07GF102K

TABLE 5-1

REFERENCE DESIGNATION	NAME OF PART AND DESCRIPTION	BENDIX PART NUMBER
	RESISTORS (Cont'd)	
R207	1000 ohms ±5%, 1/2w, composition	RC20GF102J
R208 through R211	NOT USED	
R212	470 ohms ±5%, 1/2w, composition	RC20GF471J
R213	470K ±10%, 1/4w, composition	RC07GF474K
R214	NOT USED	
R215	1000 ohms ±10%, 1/4w, composition	RC07GF102K
R216	100K ±10%, 1/4w, composition	RC07GF104K
R217	100K ±10%, 1/4w, composition	RC07GF104K
R218 through R220	NOT USED	
R221	100K ±10%, 1/4w, composition	RC07GF104K
R222	1000 ohms ±10%, 1/4w, composition	RC07GF102K
R223	1000 ohms ±10%, 1/4w, composition	RC07GF102K
R224	100K ±10%, 1/4w, composition	RC07GF104K
R225	100K ±10%, 1/4w, composition	RC07GF104K
R226	470K ±10%, 1/4w, composition	RC07GF474K
R227 through R229	NOT USED	
R230	1500 ohms ±5%, 1/4w, composition	RC07GF152J
R231	2200 ohms ±5%, 1/4w, composition	RC07GF222J
R232	47K ±10%, 1/4w, composition	RC07GF473K
R233	1000 ohms ±10%, 1/4w, composition	RC07GF102K
R234	100K ±10%, 1/4w, composition	RC07GF104K
R235	100K ±10%, 1/4w, composition	RC07GF104K
R236	NOT USED	
R237	2700 ohms ±5%, 1/4w, composition	RC07GF272J
R238	10K ohms ±10%, 1/4w, composition	RC07GF103K
R239	NOT USED	
R240	NOT USED	
R241	560 ohms ±10%, 1/4w, composition	RC07GF561K
R242	470K ±10%, 1/4w, composition	RC07GF474K
R243	150 ohms ±5%, 1/4w, composition	RC07GF151J
R244	2200 ohms ±5%, 1/4w, composition	RC07GF222J
R245	470K ±10%, 1/4w, composition	RC07GF474K
R246	NOT USED	
R247	NOT USED	

TABLE 5-1

REFERENCE DESIGNATION	NAME OF PART AND DESCRIPTION	BENDIX PART NUMBER
	RESISTORS (Cont'd)	
R248	10K ±10%, 1/2w, composition	RC20GF103K
R249	NOT USED	
R250	NOT USED	
R251	47K ±10%, 1/4w, composition	RC07GF473K
R252	NOT USED	
R253	15K ±10%, 1/4w, composition	RC07GF153K
R254 through R300	NOT USED	
R301	10K ±10%, 1/4w, composition	RC07GF103K
R302	18K ±10%, 1/4w, composition	RC07GF183K
R303	56K ±10%, 1/4w, composition	RC07GF563K
R304	18K ±10%, 1/4w, composition	RC07GF183K
R305	6800 ohms ±10%, 1/4w, composition	RC07GF682K
R306	1.8 megohms ±10%, 1/4w, composition	RC07GF185K
R307	22K ±10%, 1/4w, composition	RC07GF223K
R308 through R310	NOT USED	
R311	33K ±10%, 1/4w, composition	RC07GF333K
R312	12K ±10%, 1/4w, composition	RC07GF123K
R313	2700 ohms ±10%, 1/4w, composition	RC07GF272K
R314	680 ohms ±10%, 1/4w, composition	RC07GF681K
R315	3900 ohms ±10%, 1/4w, composition	RC07GF392K
R316	6800 ohms ±10%, 1/4w, composition	RC07GF682K
R317	1000 ohms ±10%, 1/4w, composition	RC07GF102K
R318 through R320	NOT USED	
R321	390 ohms ±10%, 1/4w, composition	RC07GF391K
R322	1.8 megohms ±10%, 1/4w, composition	RC07GF185K
R323	22K ±10%, 1/4w, composition	RC07GF223K
R324	4700 ohms ±10%, 1/4w, composition	RC07GF472K
R325	NOT USED	
R326	2700 ohms ±10%, 1/4w, composition	RC07GF272K
R327	15K ±10%, 1/4w, composition	RC07GF153K
R328 through R330	NOT USED	
R331	390 ohms ±10%, 1/4w, composition	RC07GF391K

TABLE 5-1

REFERENCE DESIGNATION	NAME OF PART AND DESCRIPTION	BENDIX PART NUMBER
	RESISTORS (Cont'd)	
R332	6800 ohms ±10%, 1/4w, composition	RC07GF682K
R333	18K ±10%, 1/4w, composition	RC07GF183K
R334	4700 ohms ±10%, 1/4w, composition	RC07GF472K
R335	1000 ohms ±10%, 1/4w, composition	RC07GF102K
R336	680 ohms ±10%, 1/4w, composition	RC07GF681K
R337	12K ±10%, 1/4w, composition	RC07GF123K
R338	10K ±5%, 1/4w, composition	RC07GF103J
R339	NOT USED	
R340	NOT USED	
R341	5600 ohms ±10%, 1/4w, composition	RC07GF562K
R342	1000 ohms ±10%, 1/4w, composition	RC07GF102K
R343	680 ohms ±10%, 1/4w, composition	RC07GF681K
R344	12K ±10%, 1/4w, composition	RC07GF123K
R345	5600 ohms ±10%, 1/4w, composition	RC07GF562K
R346	330 ohms ±10%, 1/4w, composition	RC07GF331K
R347	33K ±5%, 1/4w, composition	RC07GF333J
R348 through R350	NOT USED	
R351	3300 ohms ±10%, 1/4w, composition	RC07GF332K
R352	1000 ohms ±10%, 1/4w, composition	RC07GF102K
R353	1000 ohms ±5%, 1/4w, composition	RC07GF102J
R354	4700 ohms ±10%, 1/4w, composition	RC07GF472K
R355 through R360	NOT USED	
R361	6800 ohms ±5%, 1/4w, composition	RC07GF682J
R362	6800 ohms ±5%, 1/4w, composition	RC07GF682J
R363	68 ohms ±5%, 1/4w, composition	RC07GF680J
R364	68 ohms ±5%, 1/4w, composition	RC07GF680J
R365	4700 ohms ±10%, 1/4w, composition	RC07GF472K
R366	4700 ohms ±10%, 1/4w, composition	RC07GF472K
R367 through R400	NOT USED	
R401	15K ±10%, 1/4w, composition	RC07GF153K
R402	2200 ohms ±5%, 1/4w, composition	RC07GF222J
R403	5K ±20%, 1/3w, potentiometer, U-taper	L2088181-5
R404	12K ±5%, 1/4w, composition	RC07GF123J
R405	3300 ohms ±5%, 1/4w, composition	RC07GF332J

ELECTRICAL PARTS LIST

RA-22B VHF RECEIVER

TABLE 5-1

REFERENCE DESIGNATION	NAME OF PART AND DESCRIPTION	BENDIX PART NUMBER
	RESISTORS (Cont'd)	
R406	3900 ohms ±5%, 1/4w, composition	RC07GF392J
R407	8200 ohms ±5%, 1/4w, composition	RC07GF822J
R408 through R410	NOT USED	
R411	1000 ohms ±5%, 1/4w, composition	RC07GF102J
R412	22K ±5%, 1/4w, composition	RC07GF223J
R413	4700 ohms ±5%, 1/4w, composition	RC07GF472J
R414	10K ±5%, 1/4w, composition	RC07GF102J
R415	10K ±10%, 1/3w, potentiometer, U-taper	L2088181-7
R416	15K ±5%, 1/4w, composition	RC07GF153J
R417	15K ±5%, 1/4w, composition	RC07GF153J
R418 through R420	NOT USED	
R421	390 ohms ±5%, 1/4w, composition	RC07GF391J
R422	270K ±10%, 1/4w, composition	RC07GF274K
R423	100K ±5%, 1/4w, composition	RC07GF104J
R424	47K ±5%, 1/4w, composition	RC07GF473J
R425	2400 ohms ±5%, 1/4w, composition	RC07GF242J
R426	3300 ohms ±5%, 1/4w, composition	RC07GF332J
R427	2200 ±5%, 1/4w, composition	RC07GF222J
R428 through R430	NOT USED	
R431	2200 ohms ±5%, 1/4w, composition	RC07GF222J
R432	3900 ohms ±5%, 1/4w, composition	RC07GF392J
R433	2700 ohms ±5%, 1/4w, composition	RC07GF272J
R434	2700 ohms ±5%, 1/4w, composition	RC07GF272J
R435	2200 ohms ±10%, 1/4w, composition	RC07GF222K
R436	2700 ohms ±5%, 1/4w, composition	RC07GF272J
R437	220K ±10%, 1/4w, composition	RC07GF224K
R438	2700 ohms ±10%, 1/4w, composition	RC07GF272K
R439 through R441	NOT USED	
R442	22K ±5%, 1/4w, composition	RC07GF223J
R443	8200 ohms ±5%, 1/4w, composition	RC07GF822J
R444	15K ±5%, 1/4w, composition	RC07GF153J
R445	56K ±10%, 1/4w, composition	RC07GF563K
R446	100K ±5%, 1/4w, composition	RC07GF104J

TABLE 5-1

REFERENCE DESIGNATION	NAME OF PART AND DESCRIPTION	BENDIX PART NUMBER
	RESISTORS (Cont'd)	
R447 through R449	NOT USED	
R450	15K ±5%, 1/4w, composition	RC07GF153J
R451	3900 ohms ±5%, 1/4w, composition	RC07GF392J
R452	15K ±5%, 1/4w, composition	RC07GF153J
R453	150 ohms ±5%, 1/4w, composition	RC07GF151J
R454	5K ±20%, 1/3w, potentiometer, A-taper	L2088181-4
R455	10 ohms ±10%, 1/2w, composition	RC20GF100K
R456	1000 ohms ±10%, 1/4w, composition	RC07GF102K
R457	2700 ohms ±10%, 1/4w, composition	RC07GF272K
R458	3900 ohms ±5%, 1/4w, composition	RC07GF392J
R459	NOT USED	
R460	NOT USED	
R461	2700 ohms ±10%, 1/4w, composition	RC07GF272K
R462	18K ±10%, 1/4w, composition	RC07GF183K
R463	10K ±10%, 1/4w, composition	RC07GF103K
R464	220 ohms ±10%, 2w, composition	RC42GF221K
	THERMISTORS	
RT101	250 ohms at 37.8°C	L2088175-2
RT102 through RT400	NOT USED	
RT401	30 ohms at 37.8°C	L2088175-5
RT402	88 ohms at 37.8°C	L2088175-10
	SWITCHES	
S101A	Part of K102	
S101B	Part of K102	
S101C	Part of K102	
S101D	Part of K102	
S101E	Part of L202	
S101F	Part of L204	
S101G	Part of L206	
S101H	Part of L208	
S101J	Part of L210	
S101K	Part of L211	
S101L	Wafer, 22 position, printed-circuit type	2086741-2
S102A	Part of K104	
S102B	Part of K104	

ELECTRICAL PARTS LIST

RA-22B VHF RECEIVER

TABLE 5-1

REFERENCE DESIGNATION	NAME OF PART AND DESCRIPTION	BENDIX PART NUMBER
	SWITCHES (Cont'd)	
S102C	Part of K104	
S102D	Wafer, 20 position, printed-circuit type	2086608-1
S103 through S400	NOT USED	
S401	Push-button NC	2088712-1
	TRANSFORMERS	
T100 through T301	NOT USED	
T302	460 kc, i-f transformer	N2085502-1
T303	460 kc. i-f transformer	N2085502-1
T304	460 kc, i-f transformer	N2085502-1
T305	460 kc, i-f transformer	N2085502-1
T306	460 kc, i-f transformer	N2085502-1
T307	460 kc, i-f transformer	N2085502-1
T308	460 kc, i-f transformer	N2085502-3
	TUBES	
V100 through V200	NOT USED	
V201	5670 double triode	5670
V202	5654 pentode	5654
V203	5654 pentode	5654
V204	5670 double triode	5670
V205	5670 double triode	5670
	SOCKETS	
XQ101	3-pin transistor socket	L2088163-1
XQ102	2-pin transistor socket	L2088105-1
XQ103 through XQ300	NOT USED	
XQ301	3-pin transistor socket, with retainer ring	L2088163-4
XQ302	3-pin transistor socket, with retainer ring	L2088163-4
XQ303	3-pin transistor socket, with retainer ring	L2088163-4
XQ304	3-pin transistor socket, with retainer ring	L2088163-4
XQ305	3-pin transistor socket, with retainer ring	L2088163-4
XQ306	3-pin transistor socket, with retainer ring	L2088163-4

TABLE 5-1

REFERENCE DESIGNATION	NAME OF PART AND DESCRIPTION	BENDIX PART NUMBER
	SOCKETS (Cont'd)	
XQ307	3-pin transistor socket, with retainer ring	L2088163-4
XQ308	3-pin transistor socket, with retainer ring	L2088163-4
XQ309	3-pin transistor socket, with retainer ring	L2088163-4
XQ310	3-pin transistor socket, with retainer ring	L2088163-4
XQ311	3-pin transistor socket, with retainer ring	L2088163-4
XQ312 through XQ400	NOT USED	
XQ401	3-pin transistor socket	L2088182-1
XQ402	3-pin transistor socket	L2088182-1
XQ403	3-pin transistor socket	L2088182-1
XQ404	3-pin transistor socket	L2088182-1
XQ405	3-pin transistor socket, with retainer ring	L2088163-4
XQ406	3-pin transistor socket	L2088182-1
XQ407	3-pin transistor socket	L2088182-1
XQ408	3-pin transistor socket	L2088182-1
XQ409	3-pin transistor socket	L2088182-1
XQ410	3-pin transistor socket	L2088182-1
XV100 through XV200	NOT USED	
XV201	9-pin miniature	C2088086-2
XV202	7-pin miniature	C2088084-2
XV203	7-pin miniature	C2088084-2
XV204	9-pin miniature	C2088086-2
XV205	9-pin miniature	C2088086-2
	CRYSTALS	
Y101	Crystal, series mode, 46.5000 Mc	N2088096-123
Y102	Crystal, series mode, 47.5000 Mc	N2088096-124
Y103	Crystal, series mode, 48.5000 Mc	N2088096-125
Y104	Crystal, series mode, 49.5000 Mc	N2088096-126
Y105	Crystal, series mode, 50.5000 Mc	N2088096-127
Y106	Crystal, series mode, 51.5000 Mc	N2088096-128
Y107	Crystal, series mode, 52.5000 Mc	N2088096-129
Y108	Crystal, series mode, 53.5000 Mc	N2088096-130
Y109	Crystal, series mode, 54.5000 Mc	N2088096-131
Y110	Crystal, series mode, 55.5000 Mc	N2088096-132
Y111	Crystal, series mode, 56.5000 Mc	N2088096-133
Y112	Crystal, series mode, 57.5000 Mc	N2088096-134

TABLE 5-1

REFERENCE DESIGNATION	NAME OF PART AND DESCRIPTION	BENDIX PART NUMBER
	CRYSTALS (Cont'd)	
Y113	Crystal, series mode, 58.5000 Mc	N2088096-135
Y114	Crystal, series mode, 59.5000 Mc	N2088096-136
Y115	Crystal, series mode, 60.5000 Mc	N2088096-137
Y116	Crystal, series mode, 61.5000 Mc	N2088096-138
Y117	Crystal, series mode, 62.5000 Mc	N2088096-139
Y118	Crystal, series mode, 63.5000 Mc	N2088096-140
Y119	Crystal, series mode, 64.5000 Mc	N2088096-141
Y120	Crystal, series mode, 65.5000 Mc	N2088096-142
Y121	Crystal, series mode, 66.5000 Mc	N2088096-143
Y122	Crystal, series mode, 67.5000 Mc	N2088096-144
Y123 through Y130	NOT USED	
Y131	Crystal, parallel mode, 18.7750 Mc	N2088096-103
Y132	Crystal, parallel mode, 18.8750 Mc	N2088096-104
Y133	Crystal, parallel mode, 18.9750 Mc	N2088096-105
Y134	Crystal, parallel mode, 19.0750 Mc	N2088096-106
Y135	Crystal, parallel mode, 19.1750 Mc	N2088096-107
Y136	Crystal, parallel mode, 19.2750 Mc	N2088096-108
Y137	Crystal, parallel mode, 19.3750 Mc	N2088096-109
Y138	Crystal, parallel mode, 19.4750 Mc	N2088096-110
Y139	Crystal, parallel mode, 19.5750 Mc	N2088096-111
Y140	Crystal, parallel mode, 19.6750 Mc	N2088096-112
Y141	Crystal, parallel mode, 19.7750 Mc	N2088096-113
Y142	Crystal, parallel mode, 19.8750 Mc	N2088096-114
Y143	Crystal, parallel mode, 19.9750 Mc	N2088096-115
Y144	Crystal, parallel mode, 20.0750 Mc	N2088096-116
Y145	Crystal, parallel mode, 20.1750 Mc	N2088096-117
Y146	Crystal, parallel mode, 20.2750 Mc	N2088096-118
Y147	Crystal, parallel mode, 20.3750 Mc	N2088096-119
Y148	Crystal, parallel mode, 20.4750 Mc	N2088096-120
Y149	Crystal, parallel mode, 20.5750 Mc	N2088096-121
Y150	Crystal, parallel mode, 20.6750 Mc	N2088096-122
Y151 through Y300	NOT USED	
Y301	Crystal, parallel mode, 3315 kc	N2088096-146
Y302	Crystal, parallel mode, 3265 kc	N2088096-145

ELECTRICAL PARTS LIST

RA-22B VHF RECEIVER

TABLE 5-2

PSA-21A POWER SUPPLY

REFERENCE DESIGNATION	NAME OF PART AND DESCRIPTION	BENDIX PART NUMBER
	CAPACITORS	
C101	.01 μf GMV, 1400 vdcw, ceramic	2088016-8
C102	4 μf ±10%, 200 vdcw, metalized paper	2088296-1
	SEMICONDUCTOR DIODE	
CR101	Rectifier	2088156-2
	INDUCTORS	
L101	2H	2088291-1
L102	2 mh	285255-1
	RESISTOR	
R101	100 ohms ±10%, 2w, composition	RC42GF101K
	TRANSFORMER	
T101	Transformer	2088292-1

SECTION V

ELECTRICAL PARTS LIST

RA-22B VHF RECEIVER

TABLE 5-3

PSA-21B POWER SUPPLY

REFERENCE DESIGNATION	NAME OF PART AND DESCRIPTION	BENDIX PART NUMBER
	CAPACITORS	
C101	20μf, 60vdcw, tantalytic	2088254-4
C102	20μf, 60vdcw, tantalytic	2088254-4
C103	2μf, 200vdcw, mylar	2082015-1
C104	2μf, 200vdcw, mylar	2082015-1
	SEMICONDUCTOR DIODES	
CR101	Rectifier, silicon IN2071	2088489-1
CR102	Rectifier, silicon IN2071	2088489-1
	INDUCTORS	
L101	11.2MH	2082017-1
L102	50μh	215350-48
	CONNECTORS	
P101	14 Pin	2088117-1
	TRANSISTORS	
Q101	2N638A or 2N268	2088276-1
Q102	2N638A or 2N268	2088276-1
	RESISTORS	
R101	270 ohms ±5%, 1/2w, composition	RC20GF271J
R102	68 ohms ±5%, 1/2w, composition	RC20GF680J
R103	2.7K ohms ±5%, 1/2w, composition	RC20GF272J
R104	270K ohms ±5%, 1/2w, composition	RC20GF274J
	THERMISTORS	
RT101	16 ohms ±10% @25°C	2088612-1
	2.2 ohms ±10% @85°C	
	293 ohms ±10% @-45°C	
	TRANSFORMERS	
T101	Toroid	2082016-1
	Board, printed wiring (outer)	2081958-1
	Board, printed wiring (inner)	2086191-1

SECTION V

ELECTRICAL PARTS LIST

RA-22B VHF RECEIVER

TABLE 5-4

PSA-21B-1 POWER SUPPLY

REFERENCE DESIGNATION	NAME OF PART AND DESCRIPTION	BENDIX PART NUMBER
	CAPACITORS	
C101	$20\mu f^{+20\%}_{-15\%}$, 60vdcw, tantalytic	222299-4
C102	$20\mu f^{+20\%}_{-15\%}$, 60vdcw, tantalytic	222299-4
C103	$2\mu f^{+30\%}_{-10\%}$, 150vdcw, mylar	2088540-1
C104	$2\mu f^{+30\%}_{-10\%}$, 150vdcw, mylar	2088540-1
	SEMICONDUCTOR DIODES	
CR101	Rectifier, silicon IN2071	2088489-1
CR102	Rectifier, silicon IN2071	2088489-1
	INDUCTORS	
L101	11.2mh	2086024-1
L102	50 μh	2088541-1
	CONNECTORS	
P101	14 Pin	2088117-1
	TRANSISTORS	
Q101	2N638A or 2N268	2088276-1
Q102	2N638A or 2N268	2088276-1
	RESISTORS	
R101	270 ohms ±5%, 1/2w, composition	RC20FG271J
R102	68 ohms ±5%, 1/2w, composition	RC20GF680J
R103	2.7K ohms ±5%, 1/2w, composition	RC20GF272J
R104	82K ohms ±5%, 1/2w, composition	RC20GF823J
	THERMISTORS	
RT101	16 ohms ±10% @25°C 2.2 ohms ±10% @85°C 293 ohms ±10% @-45°C	2088542-1
	TRANSFORMERS	
T101	Toroid	2086025-1
	Board, printed wiring (outer)	2081716-1
	Board, printed wiring (inner)	2081715-1

TABLE 5-5
LIST OF MISCELLANEOUS REPLACEABLE MECHANICAL PARTS

REFERENCE DESIGNATION	FIGURE NUMBER	NAME OF PART AND DESCRIPTION	BENDIX PART NUMBER
MP101	4-3	Cover	2083023-1
MP102	4-2, 4-10, 4-12	Cover, crystal assembly	2086599-2
MP103	4-3	Cover assembly, left side	2086723-2
MP104	4-2	Cover assembly, right side	2086724-2
MP105	4-2, 4-10, 4-12	Dial	2082598-1
MP106	4-2, 4-11	Handle	L2088077-4
MP107	4-2	Hinge Assembly	2086688-2
MP108	4-2, 4-11	Insert, rollover	N2080818-13
MP109	4-3	Plate assembly	2086686-2
MP110	4-3, 4-12	Shield assembly	2086755-2
MP111	4-3	Shield, relay	2082671-1

SECTION V
ELECTRICAL PARTS LIST

4 RAX-21/22 SUPER SQUELCH

TABLE 5-6.

REFERENCE DESIGNATION	NAME OF PART AND DESCRIPTION	BENDIX PART NUMBER
	CAPACITORS	
C1	30 μμf ±2%, 500 vdc, mica	2088000-208
C2	22 μμf ±2%, 500 vdc, mica	2088000-221
C3	200 μμf ±2%, 500 vdc, mica	2088000-248
C4	75 μμf ±2%, 500 vdc, mica	2088000-244
C5	220 μμf ±2%, 500 vdc, mica	2088000-234
C6	.1 μf ±20%, 35 vdc, tantalum	2088201-8
C7 thru C9	NOT USED	
C10	62 μμf ±2%, 500 vdc, mica	2088537-234
C11	390 μμf ±2%, 500 vdc, mica	2088000-255
C12	300 μμf ±2%, 500 vdc, mica	2088000-254
C13	250 μμf ±2%, 500 vdc, mica	2088000-222
C14	300 μμf ±2%, 500 vdc, mica	2088000-254
C15	1 μf ±20%, 35 vdc, tantalum	2088355-13
C16	620 μμf ±10%, 300 vdc, mica	2088000-546
C17	24 μμf ±2%, 500 vdc, mica	2088000-229
C18 thru C20	NOT USED	
C21	620 μμf ±10%, 300 vdc, mica	2088000-546
C22	30 μμf ±2%, 500 vdc, mica	2088537-209
C23	.0082 μf ±5%, 100 vdc, polystyrene	2089305-0722
C24	220 μμf ±2%, 500 vdc, mica	2088000-234
C25	8 μf +50 -15%, 30 volts, tantalytic	2088619-18
C26	8 μf +50 -15%, 30 volts, tantalytic	2088619-18
C27	8 μf +50% -15%, 30 volts, tantalytic	2088619-18
	SEMICONDUCTOR DIODES	
CR1	Silicon Diode HD6002	291664-1
CR2	Silicon Diode HD6002	291664-1
CR3	Zener Diode 1N754A	2088809-18
CR4	Zener Diode IN751A	2088809-12
	INDUCTORS	
L1	5600 μh ±10%	2088300-56
L2	2200 μh ±10%	2088300-55
L3	2200 μh ±10%	2088300-55
L4	Coil Assembly	2085759-12
L5	Coil Assembly	2085759-12

SECTION V
ELECTRICAL PARTS LIST

4RAX-21/22 SUPER SQUELCH

TABLE 5-6.

REFERENCE DESIGNATION	NAME OF PART AND DESCRIPTION	BENDIX PART NUMBER
	INDUCTORS	
L6	5600 μh ±10%	2088300-56
L7	1.1h ±5%	2088205-2
	TRANSISTORS	
Q1	2N338, NPN	2088262-34
Q2	2N1742, PNP	2089142-0701
Q3	2N338, NPN	2088262-34
Q4	2N2270, NPN	2088262-31
	RESISTORS	
R1	22K ±5%, 1/4w, composition	RC07GF223J
R2	5.6K ±5%, 1/4w, composition	RC07GF562J
R3	1.5K ±5%, 1/4w, composition	RC07GF152J
R4	2.2K ±5%, 1/4w, composition	RC07GF222J
R5	15K ±5%, 1/4w, composition	RC07GF153J
R6	2.2K ±5%, 1/4w, composition	RC07GF222J
R7	33K ±5%, 1/4w, composition	RC07GF333J
R8 thru R10	NOT USED	
R11	3.9K ±5%, 1/4w, composition	RC07GF392J
R12	NOT USED	
R13	22K ±5%, 1/4w, composition	RC07GF223J
R14	2000 ohms ±5%, 1/2w, potentiometer, A-taper	2088946-3
R15	3.9K ±5%, 1/4w, composition	RC07GF392J
R16	10K ±5%, 1/4w, composition	RC07GF103J
R17	NOT USED	
R18	470 ohms ±5%, 1/4w, composition	RC07GF471J
R19	2000 ohms ±5%, variable, wirewound	2068420-0701
	SOCKETS	
XQ1	3-pin transistor socket	2088570-1
XQ2	3-pin transistor socket	2088570-1
XQ3	3-pin transistor socket	2088570-1
XQ4	3-pin transistor socket	2088570-1
XY1	2-pin socket	2088483-1
XY2	2-pin socket	2088483-1
	CRYSTALS	
Y1	Crystal, series mode, 636 kc	2088591-12
Y2	Crystal, series mode, 634 kc	2088591-11

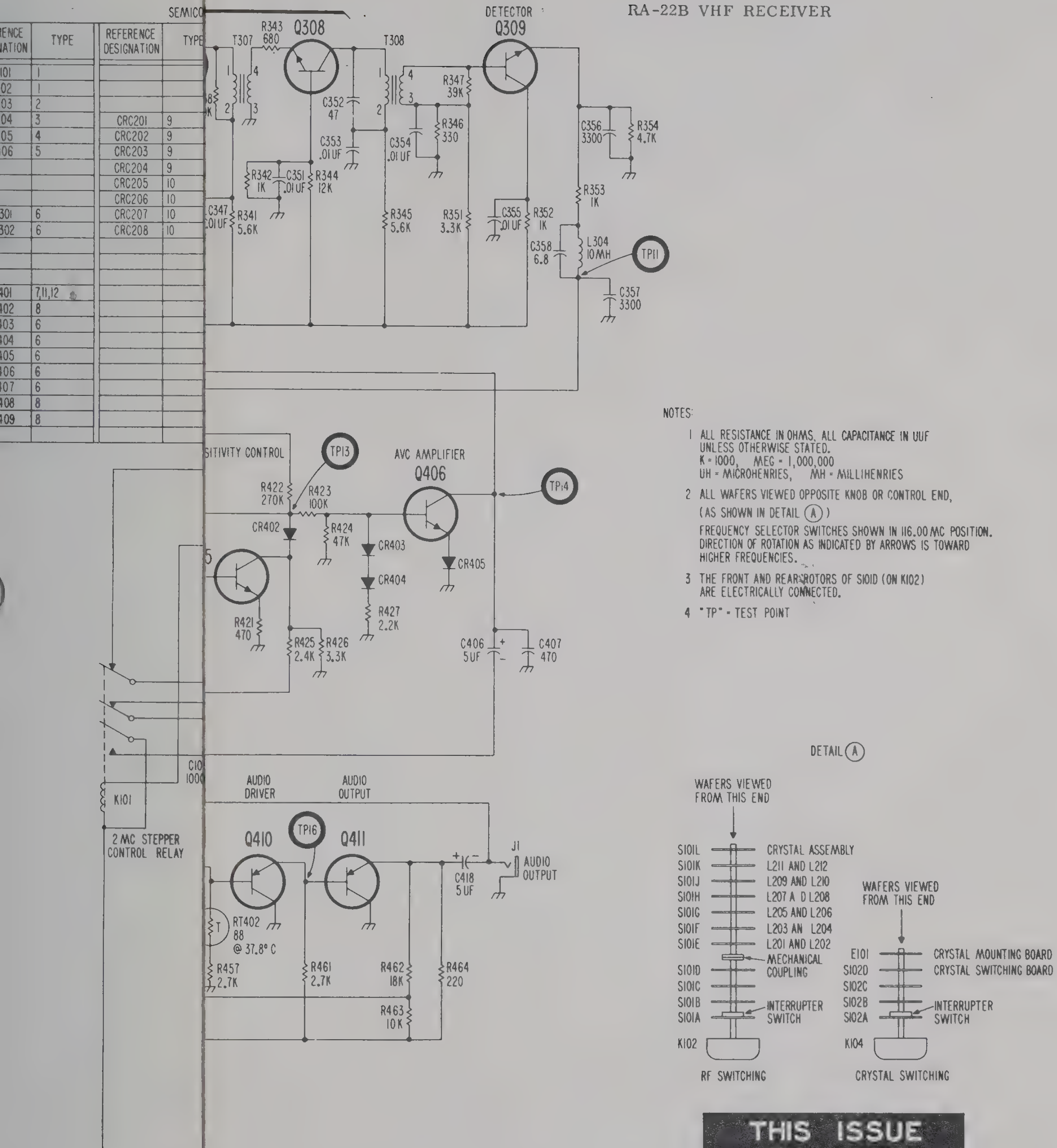
6-1. GENERAL

This section contains schematic diagrams and power supply diagrams for the RA-22B VHF Receiver as listed below.

SUMMARY OF REVISIONS TO

FIGURE 6-1
RA-22B VHF RECEIVER
SCHEMATIC DIAGRAM DRAWING NO. 2087705

SCHEMATIC ISSUE	REVISION DESCRIPTION	EFFECTIVITY SUB-ASSY CHANGE IDENT	EFFECTIVITY STARTING WITH UNIT S/N	EFFECTIVITY UNIT MOD NUMBER
A thru C	Revised prior to release.	-	-	-
D	Replaced Q101 and XQ101. Old type no longer available. Reference Service Bulletin M-472.	-	1453	-
E	Changed the value of R347 to improve localizer operation.	-	1201	-
F	L227 added to improve sensitivity and squelch operation. Accomplished initially in units with Serial Nos. 1111 and 1222.	-	1377	-
	Changed R347 to improve squelch operation.	-	1387	-
G	Changed C207 and C222 to improve r-f response.	-	1387	-
H	Added C109, C110 and C368 to reduce conducted noise.	-	1	-
	Added C420 to reduce ledex switching noise from audio.	-	1	-
J	Changed R453 to increase audio frequency gain.	-	BLT-130	-
K	Removed R325 to improve i-f selectivity, and changed R421 to increase squelch control range.	-	1517	-



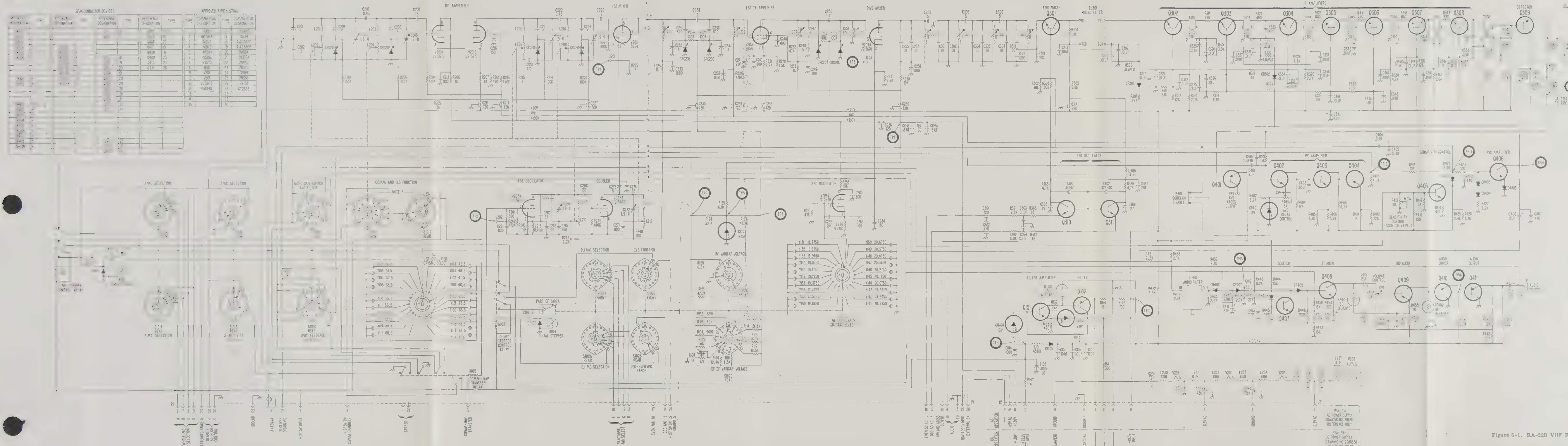
THIS ISSUE HAS BEEN SUPERSEDED BY A LATER ISSUE

Figure 6-1. RA-22B VHF Receiver, Schematic Diagram

SUMMARY OF REVISIONS TO

FIGURE 6-1
RA-22B VHF RECEIVER
SCHEMATIC DIAGRAM DRAWING NO. 2087705

SCHEMATIC ISSUE	REVISION DESCRIPTION	EFFECTIVITY		
		SUB-ASSY CHANGE IDENT	STARTING WITH UNIT S/N	UNIT MOD NUMBER
A thru C	Revised prior to release.	-	-	-
D	Replaced Q101 and XQ101. Old type no longer available. Reference Service Bulletin M-472.	-	1453	-
E	Changed the value of R347 to improve localizer operation.	-	1201	-
F	L227 added to improve sensitivity and squelch operation. Accomplished initially in units with Serial Nos. 1111 and 1222.	-	1377	-
	Changed R347 to improve squelch operation.	-	1387	-
G	Changed C207 and C222 to improve r-f response.	-	1387	-
H	Added C109, C110 and C368 to reduce conducted noise.	-	1	-
	Added C420 to reduce ledex switching noise from audio.	-	1	-
J	Changed R453 to increase audio frequency gain.	-	BLT-130	-
K	Removed R325 to improve i-f selectivity, and changed R421 to increase squelch control range.	-	1517	-



NOTES

UNLESS OTHERWISE STATED
K - 1000, MEG - 1 000 000
UH - MICROHENRIES, MH - MILLIHENRIES

2. ALL WAFERS VIEWED OPPOSITE KNOB OR CONTROL END (AS SHOWN IN DETAIL A)
DIRECTION OF ROTATION AS INDICATED BY ARROWS IS TOWARD HIGHER FREQUENCIES.

3. THE FRONT AND REAR ROTORS OF S101D (ON K102) ARE ELECTRICALLY CONNECTED.

4. "TP" - TEST POINT

DETAIL A

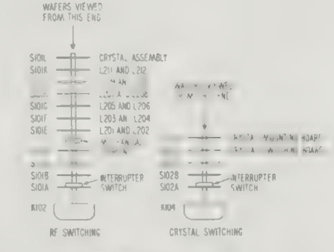


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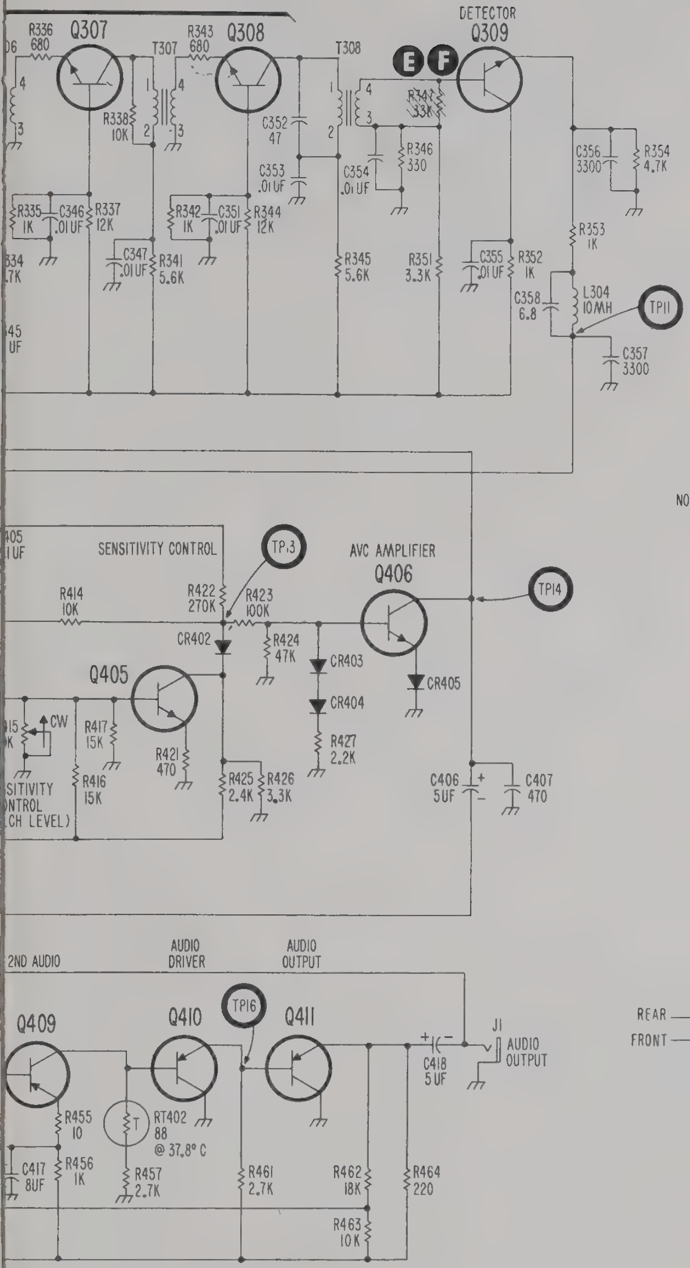
Figure 6-1. RA-22B VHF Receiver, Schematic Diagram



NOTES

1. ALL RESISTANCE IN OHMS, ALL CAPACITANCE IN UUF UNLESS OTHERWISE STATED.
   K = 1000, MEG = 1,000,000
   UH = MICROHENRIES, MH = MILLIHENRIES
2. ALL WAFERS VIEWED OPPOSITE KNOB OR CONTROL END, (AS SHOWN IN DETAIL (A))
   FREQUENCY SELECTOR SWITCHES SHOWN IN 116.00 MC POSITION. DIRECTION OF ROTATION AS INDICATED BY ARROWS IS TOWARD HIGHER FREQUENCIES. FRONT OF SWITCH WAFERS ARE SHOWN AS IF VIEWED THRU REAR OF WAFER.
3. THE FRONT AND REAR ROTORS OF S101D (ON K102) ARE ELECTRICALLY CONNECTED.
4. "TP" = TEST POINT.

DETAIL (A)

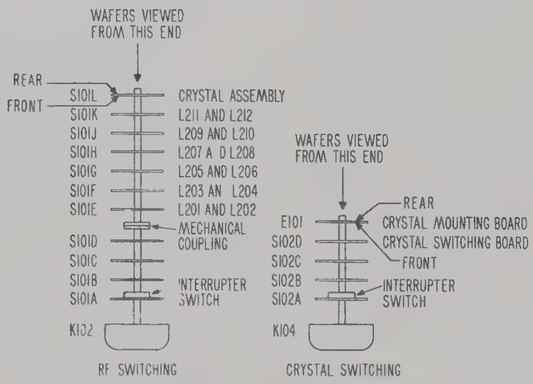


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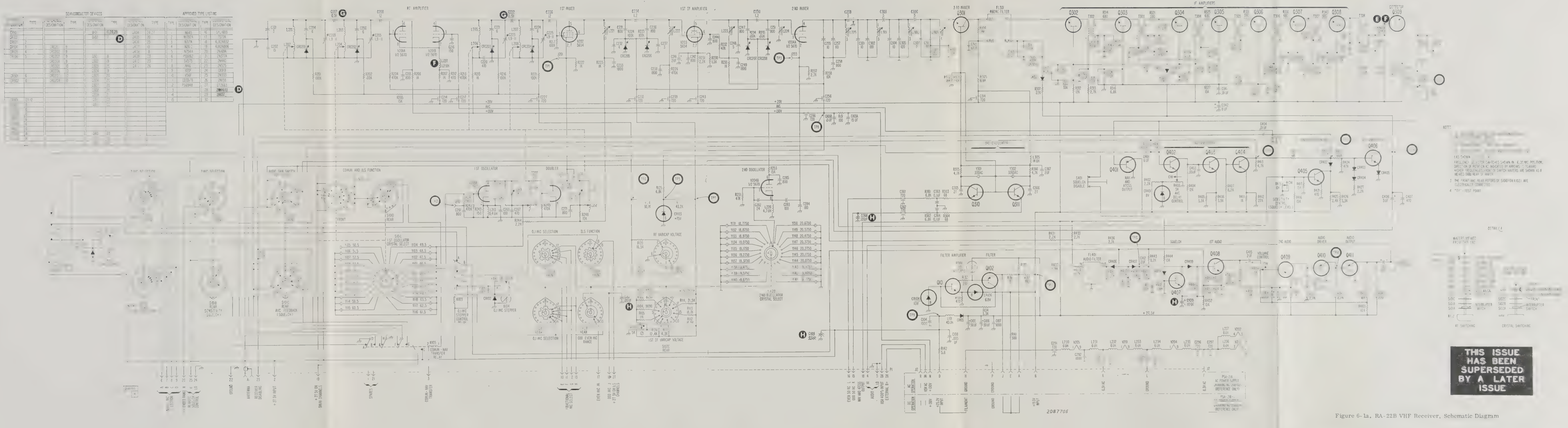
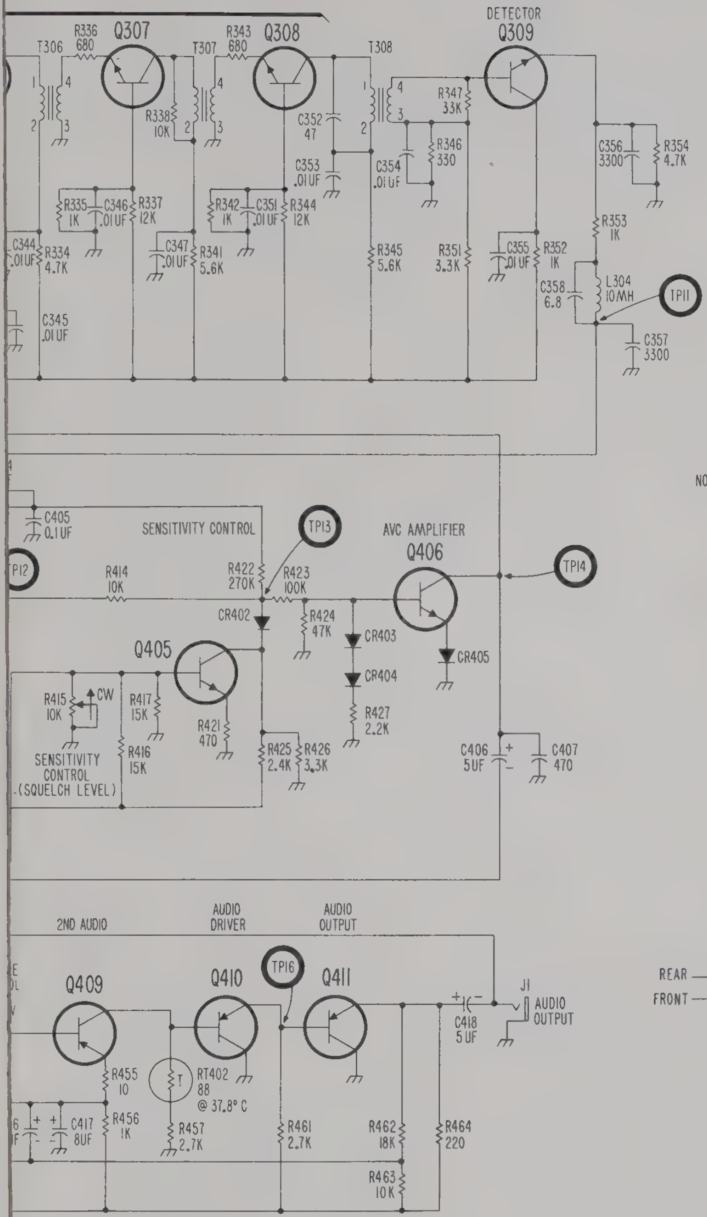
Figure 6-1a. RA-22B VHF Receiver, Schematic Diagram



THIS ISSUE HAS BEEN SUPERSEDED BY A LATER ISSUE

Figure 6-1a. RA-22B VHF Receiver, Schematic Diagram



NOTES:

1. ALL RESISTANCE IN OHMS, ALL CAPACITANCE IN UUF UNLESS OTHERWISE STATED.
   K = 1000, MEG = 1,000,000
   UH = MICROHENRIES, MH = MILLIHENRIES
2. ALL WAFERS VIEWED OPPOSITE KNOB OR CONTROL END, (AS SHOWN IN DETAIL (A))
   FREQUENCY SELECTOR SWITCHES SHOWN IN 116.00 MC POSITION. DIRECTION OF ROTATION AS INDICATED BY ARROWS IS TOWARD HIGHER FREQUENCIES. FRONT OF SWITCH WAFERS ARE SHOWN AS IF VIEWED THRU REAR OF WAFER.
3. THE FRONT AND REAR ROTORS OF S101D (ON K102) ARE ELECTRICALLY CONNECTED.
4. "TP" - TEST POINT.

DETAIL (A)

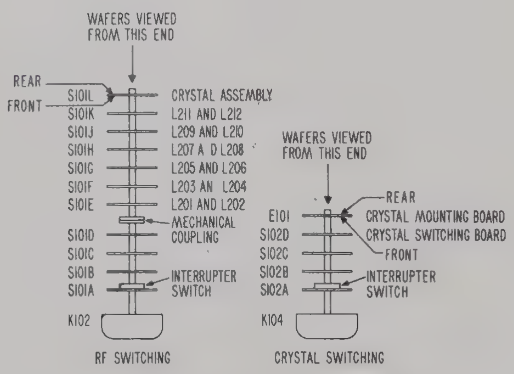


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Figure 6-1b. RA-22B VHF Receiver, Schematic Diagram

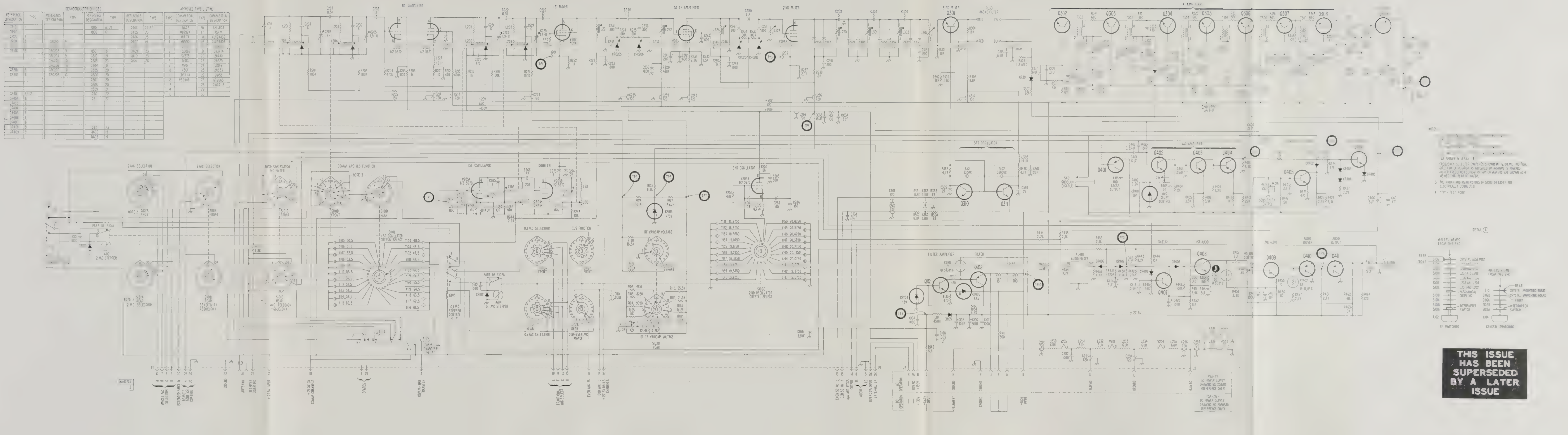
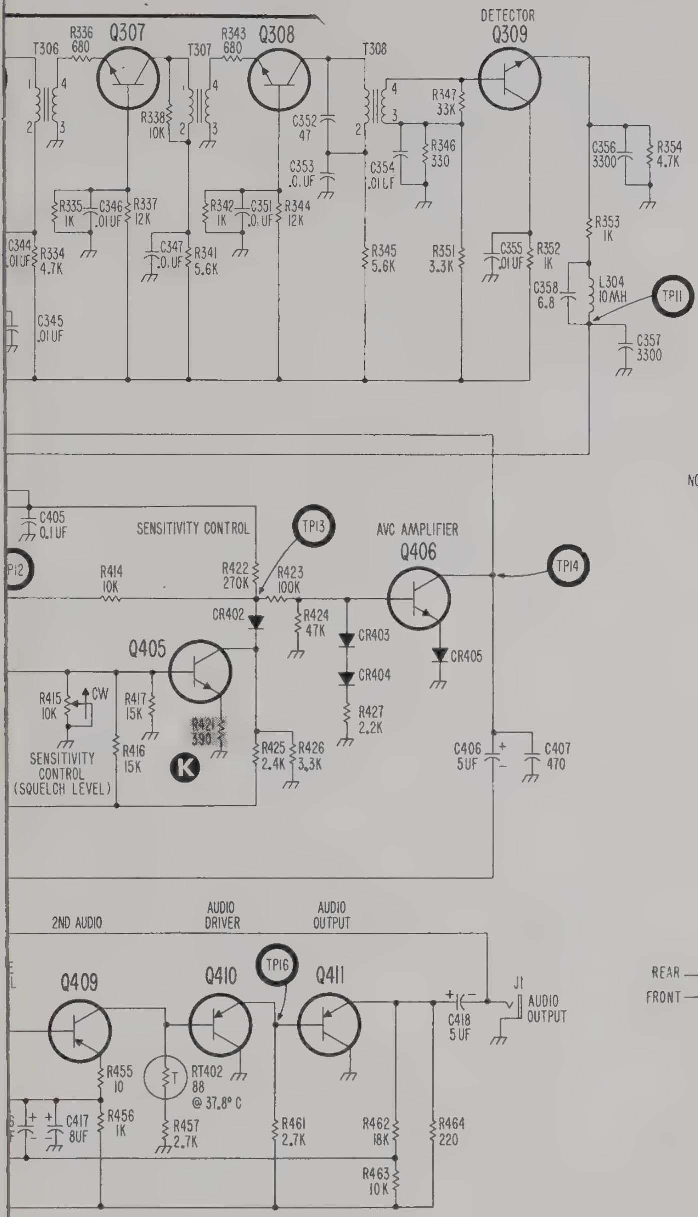


Figure 6-1b, RA-22B VHF Receiver, Schematic Diagram
June 1967



NOTES:

1. ALL RESISTANCE IN OHMS, ALL CAPACITANCE IN UUF UNLESS OTHERWISE STATED.
   K = 1000, MEG = 1,000,000
   UH = MICROHENRIES, MH = MILLIHENRIES
2. ALL WAFERS VIEWED OPPOSITE KNOB OR CONTROL END, (AS SHOWN IN DETAIL (A))
   FREQUENCY SELECTOR SWITCHES SHOWN IN 116.00MC POSITION. DIRECTION OF ROTATION AS INDICATED BY ARROWS IS TOWARD HIGHER FREQUENCIES. FRONT OF SWITCH WAFERS ARE SHOWN AS IF VIEWED THRU REAR OF WAFER.
3. THE FRONT AND REAR ROTORS OF S101D (ON K102) ARE ELECTRICALLY CONNECTED.
4. "TP" = TEST POINT.

DETAIL (A)

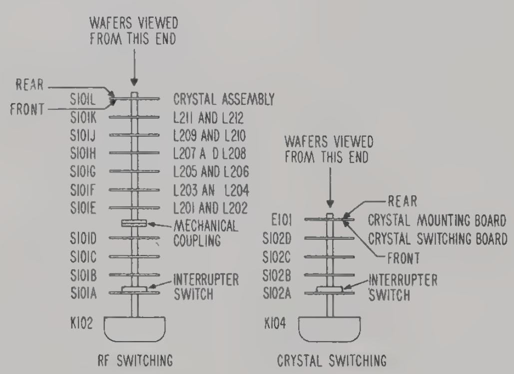


Figure 6-1c. RA-22B VHF Receiver, Schematic Diagram

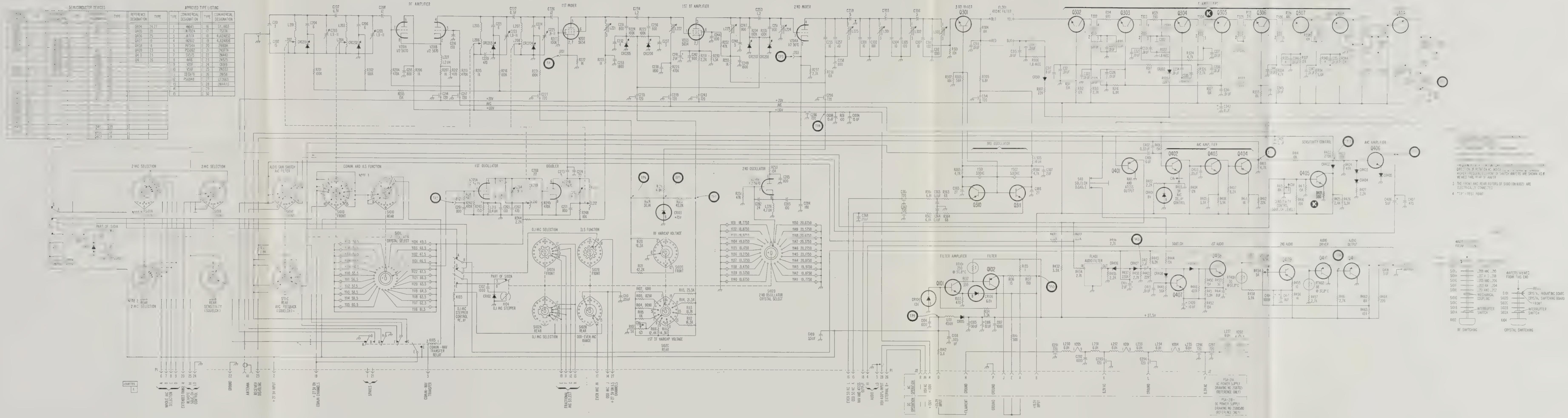


Figure 6-1c. RA-22B VHF Receiver, Schematic Diagram

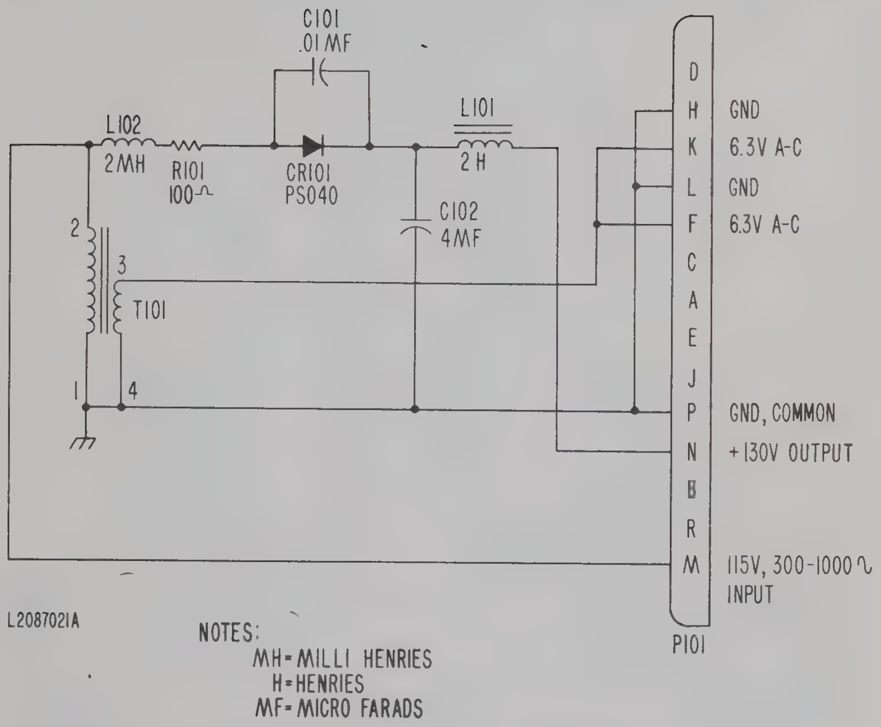


Figure 6-2. PSA-21A Power Supply, Schematic Diagram

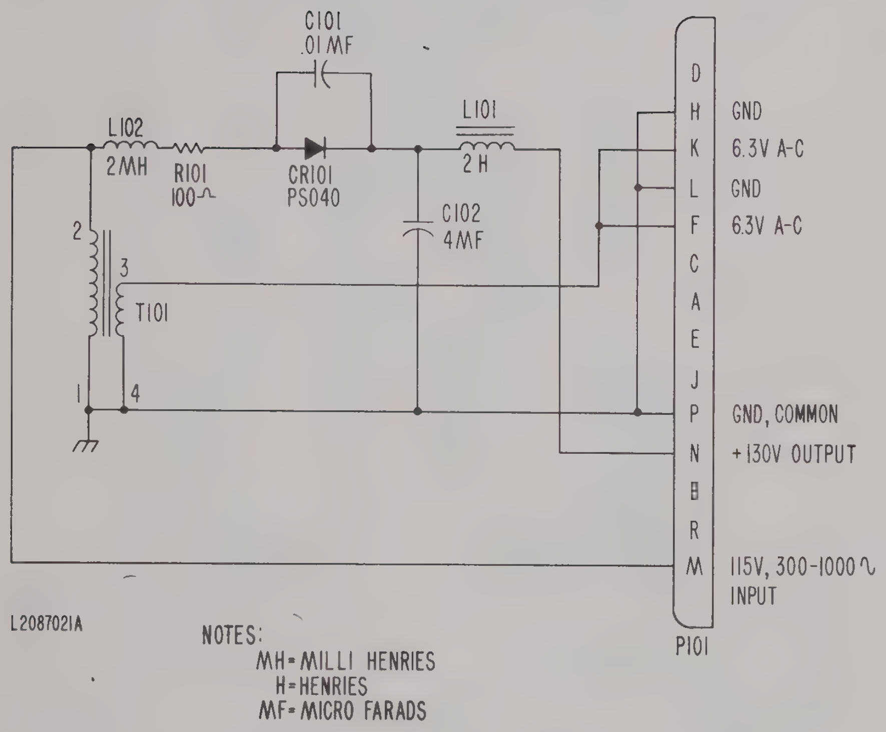


Figure 6-2. PSA-21A Power Supply, Schematic Diagram

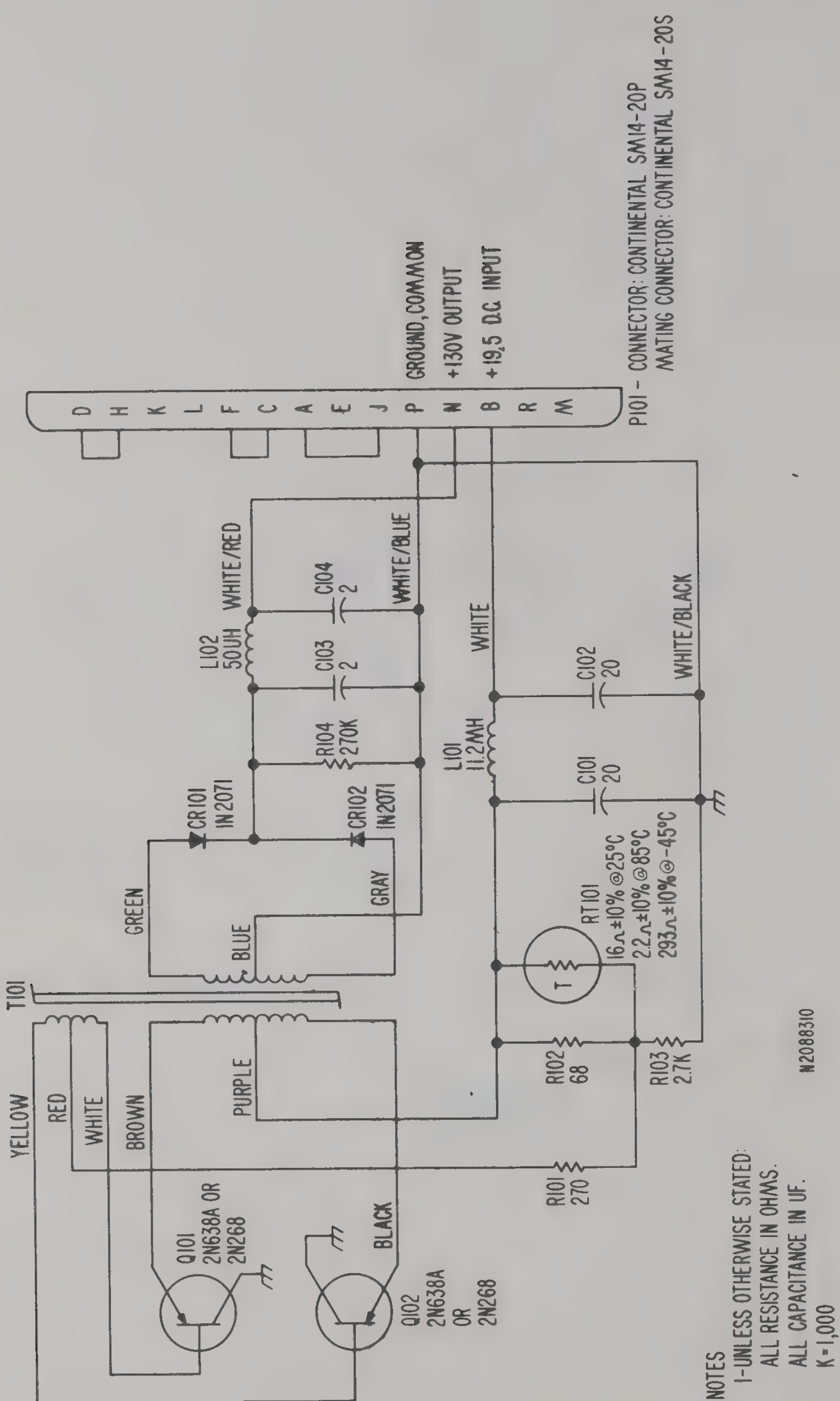


Figure 6-3. PSA-21B Power Supply, Schematic Diagram

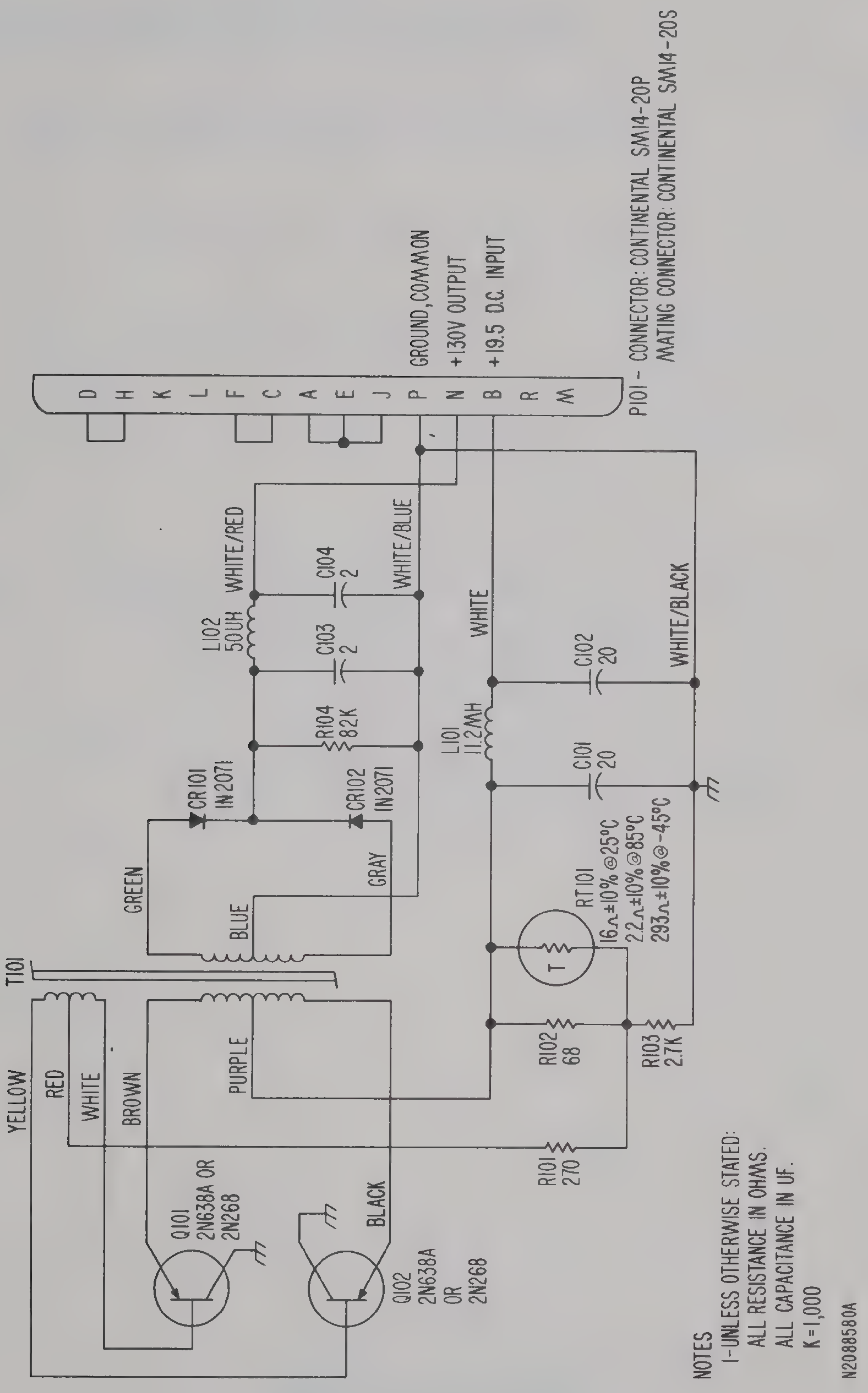
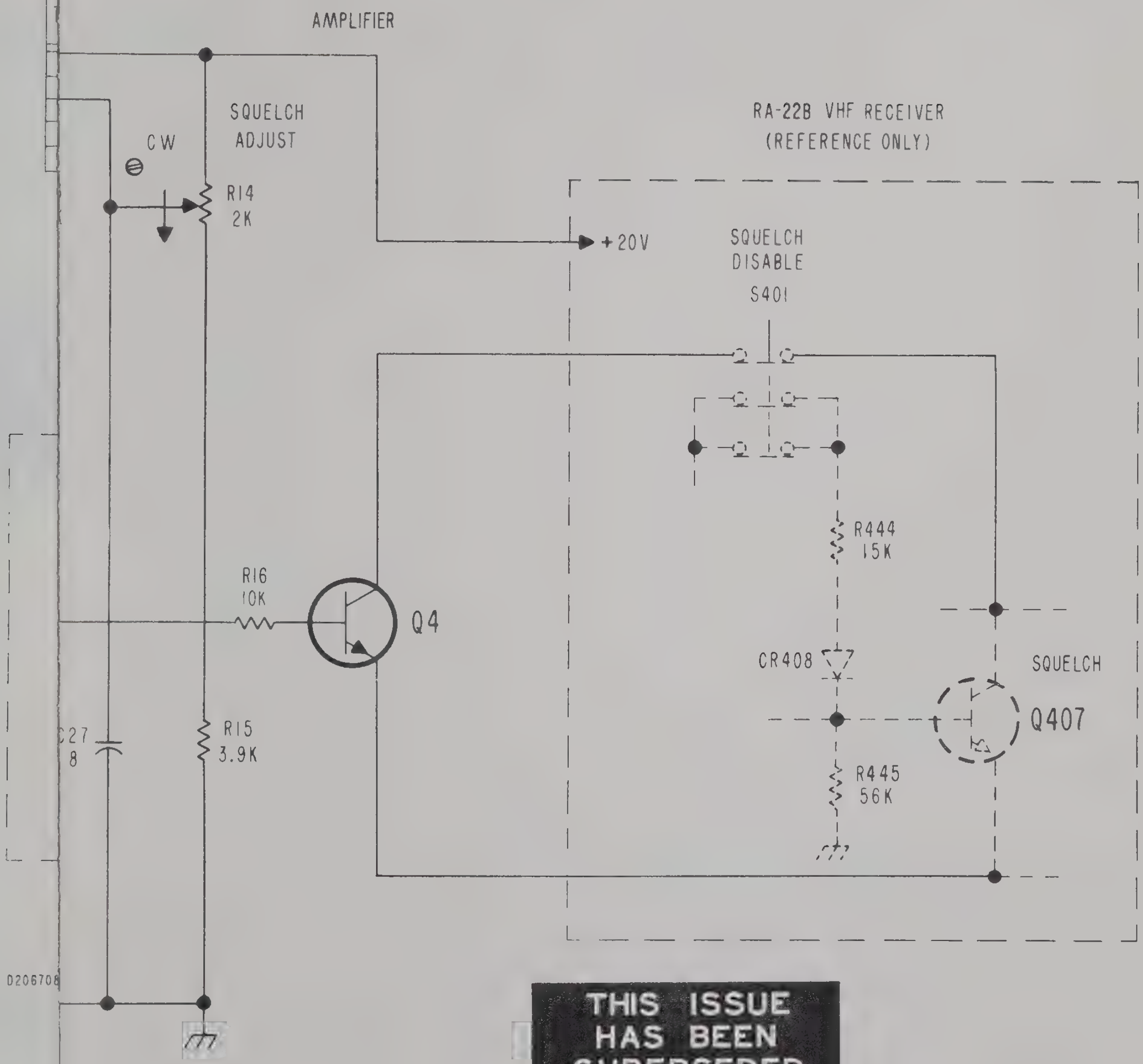


Figure 6-4. PSA-21B-1 Power Supply, Schematic Diagram.

SUMMARY OF REVISIONS TO

FIGURE 6-5
4RAX-21/22 SUPER SQUELCH OPTION
SCHEMATIC DIAGRAM DRAWING NO. 2067087

SCHEMATIC ISSUE	REVISION DESCRIPTION	EFFECTIVITY SUB-ASSY CHANGE IDENT	EFFECTIVITY STARTING WITH UNIT S/N	EFFECTIVITY UNIT MOD NUMBER
A	Revised prior to release.	-	-	-
B	Changed Type No. of Q4 to insure sufficient gain in super squelch output stage.	-	1064	-
C	Diodes CR2 and CR3 added to disable super squelch during NAV operation.	-	1598 and BLT-38	-
D	Changed values of C11, C12, C13 and R11; added C10, R18, and R19; deleted C7 and R12; to improve bandwidth and gain. Effective in units with Serial Nos. BLT-40 and BLT-114.	-	BLT-129	-
E	Provide correct description for C16 and C21.	-	-	-
F	Added CR4 to provide more reliable operation of the Super Squelch. Effective with chassis marked with yellow dot.	-	-	-



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HAS BEEN
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BY A LATER
ISSUE

Figure 6-5. 4RAX-21/22 Super Squelch Option, Schematic Diagram

SUMMARY OF REVISIONS TO

FIGURE 6-5
4RAX-21/22 SUPER SQUELCH OPTION
SCHEMATIC DIAGRAM DRAWING NO. 2067087

SCHEMATIC ISSUE	REVISION DESCRIPTION	EFFECTIVITY		
		SUB-ASSY CHANGE IDENT	STARTING WITH UNIT S/N	UNIT MOD NUMBER
A	Revised prior to release.	-	-	-
B	Changed Type No. of Q4 to insure sufficient gain in super squelch output stage.	-	1064	-
C	Diodes CR2 and CR3 added to disable super squelch during NAV operation.	-	1598 and BLT-38	-
D	Changed values of C11, C12, C13 and R11; added C10, R18, and R19; deleted C7 and R12; to improve bandwidth and gain. Effective in units with Serial Nos. BLT-40 and BLT-114.	-	BLT-129	-
E	Provide correct description for C16 and C21.	-	-	-
F	Added CR4 to provide more reliable operation of the Super Squelch. Effective with chassis marked with yellow dot.	-	-	-

SEMICONDUCTOR DEVICES

REFERENCE DESIGNATION	TYPE	REFERENCE DESIGNATION	TYPE
CR1	1	Q1	6
		Q2	7
		Q3	6
		Q4	~~8~~ 9

NOTES:

1. ALL RESISTANCE IN OHMS. K=1000
   ALL CAPACITANCE IN UF UNLESS OTHERWISE STATED.
2. MODIFICATION SPECIFICATION 2072937-0001, (REFERENCE ONLY)

APPROVED TYPE LISTING

TYPE	COMMERCIAL DESIGNATION	TYPE	COMMERCIAL DESIGNATION
1	HD6002	6	2N338
2		7	2N1742
3		8	2N333
4		9	2N2270
5		10	

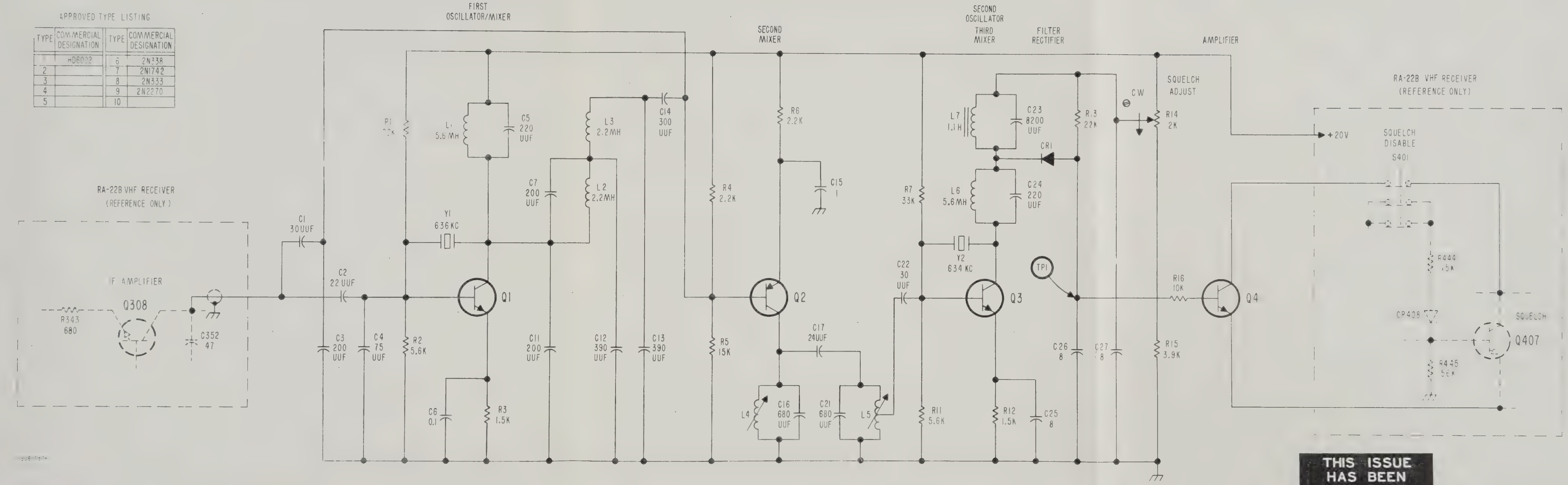

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Figure 6-5. 4RAX-21/22 Super Squelch Option, Schematic Diagram

APPROVED TYPE LISTING

TYPE	COMMERCIAL DESIGNATION	TYPE	COMMERCIAL DESIGNATION
1	HD6002	6	2N338
2	IN754A	7	2N1742
3		8	2N333
4		9	2N2270
5.		10	

SEMICONDUCTOR DEVICES

REFERENCE DESIGNATION	TYPE	REFERENCE DESIGNATION	TYPE
CR1	1	Q1	6
CR2	1	Q2	7
CR3	2	Q3	6
		Q4	~~8~~ 9

NOTES:
1. ALL RESISTANCE IN OHMS. K=1000
   ALL CAPACITANCE IN UF UNLESS OTHERWISE STATED.
2. MODIFICATION SPECIFICATION 2072937-0001, (REFERENCE ONLY)

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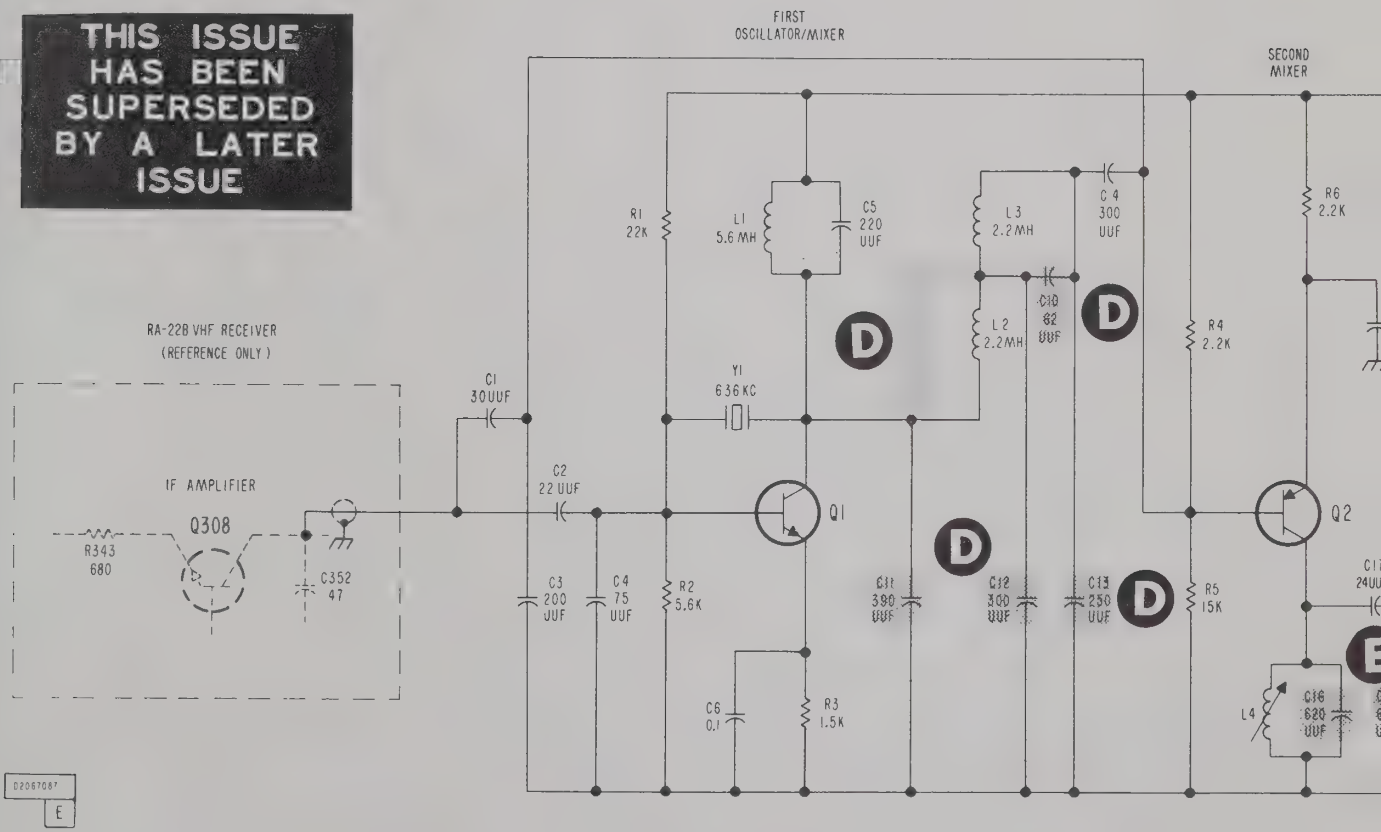

Figure 6-5a. 4RAX-21/22 Super Squelch Option, Schematic Diagram

APPROVED TYPE LISTING

TYPE	COMMERCIAL DESIGNATION	TYPE	COMMERCIAL DESIGNATION
1	HD6002	6	2N338
2	IN754A	7	2N1742
3		8	2N333
4		9	2N2270
5.		10	

SEMICONDUCTOR DEVICES

REFERENCE DESIGNATION	TYPE	REFERENCE DESIGNATION	TYPE
CR	.	Q	6
CR2	1	Q2	7
CR3	2	Q3	6
		Q4	~~8~~9

NOTES:
1. ALL RESISTANCE IN OHMS. K=1000
ALL CAPACITANCE IN UF UNLESS OTHERWISE STATED.
2. MODIFICATION SPECIFICATION 2072937-0001, (REFERENCE ONLY)

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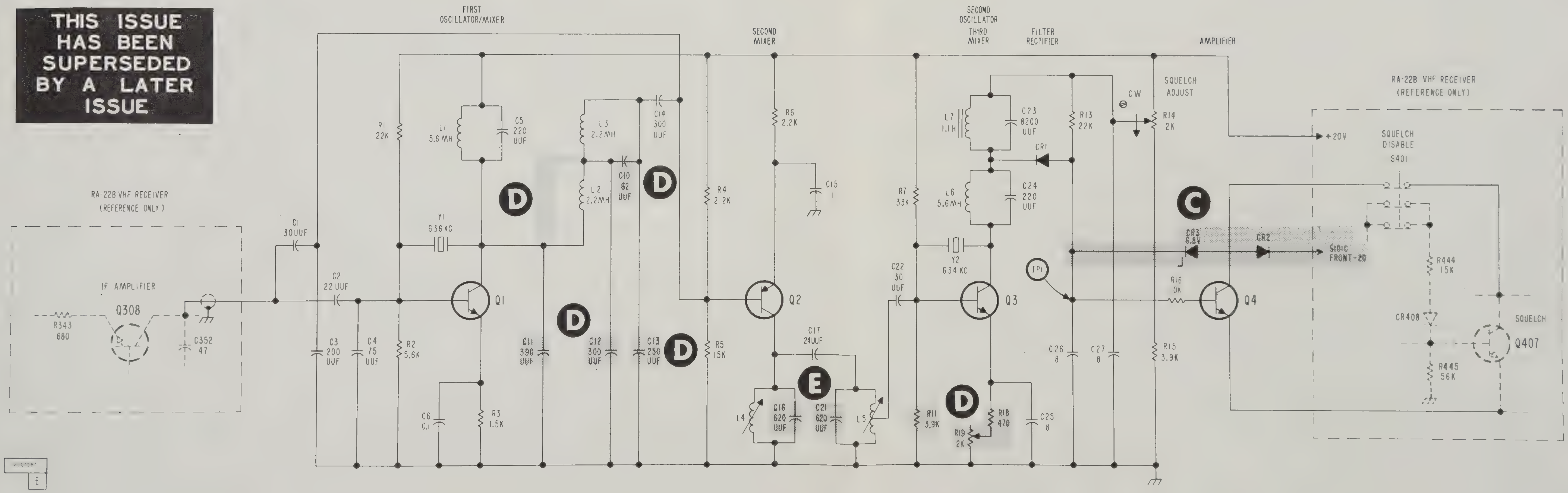
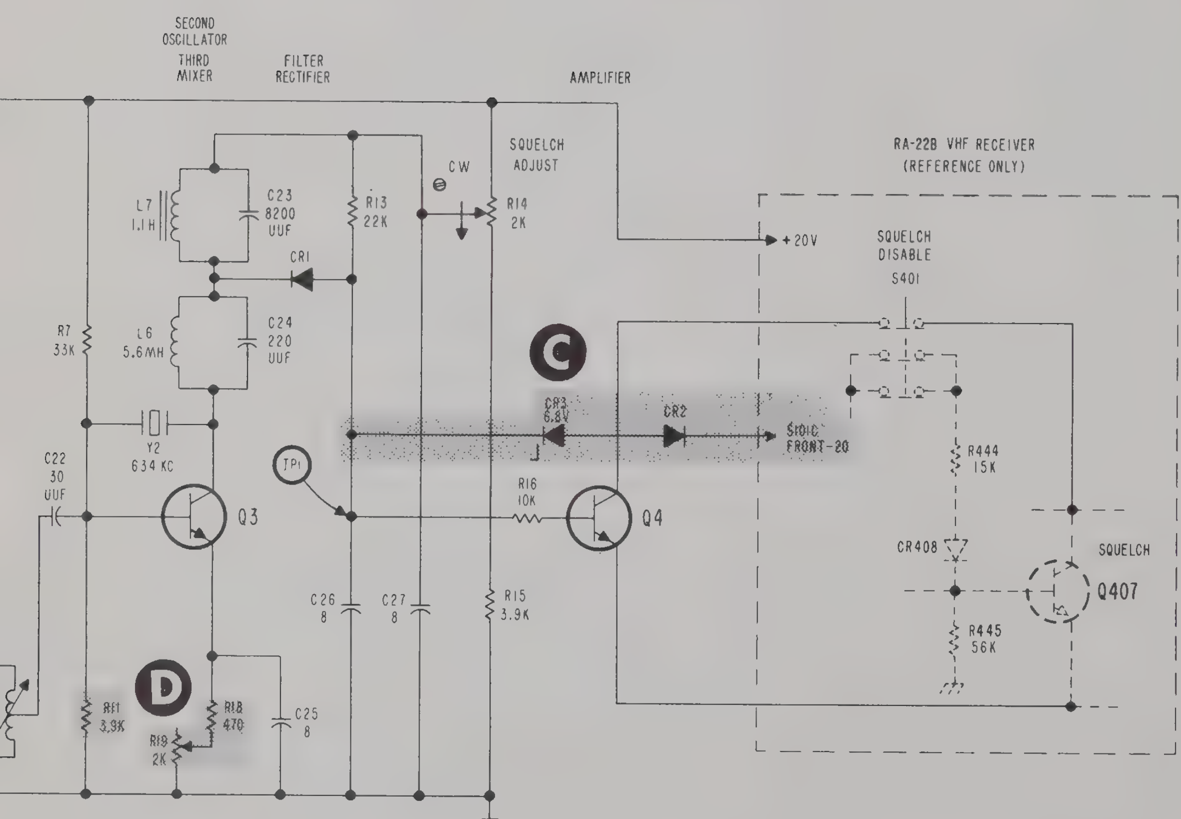


Figure 6-5a. 4RAX-21/22 Super Squelch Option, Schematic Diagram


SECOND OSCILLATOR
THIRD MIXER
FILTER RECTIFIER
AMPLIFIER
SQUELCH ADJUST
CW
R14 2K
R13 22K
L7 1.1H
C23 8200 UUF
CR1
L6 5.6MH
C24 220 UUF
R7 33K
Y2 634 KC
C22 30 UUF
Q3
TP1
CR3 6.8V
CR2
S101C FRONT-20
R16 10K
Q4
C26 8
C27 8
R15 3.9K
C
D
R11 3.3K
R18 470
R19 2K
C25 8
RA-22B VHF RECEIVER (REFERENCE ONLY)
+20V
SQUELCH DISABLE
S401
R444 15K
CR408
SQUELCH
Q407
R445 56K

SEMICONDUCTOR DEVICES

REFERENCE DESIGNATION	TYPE	REFERENCE DESIGNATION	TYPE
CR1	1	Q1	6
CR2	1	Q2	7
CR3	2	Q3	6
CR4	3	Q4	~~8~~9

NOTES:
1. ALL RESISTANCE IN OHMS. K=1000
   ALL CAPACITANCE IN UF UNLESS OTHERWISE STATED.
2. MODIFICATION SPECIFICATION 2072937-0001, (REFERENCE ONLY)

APPROVED TYPE LISTING

TYPE	COMMERCIAL DESIGNATION	TYPE	COMMERCIAL DESIGNATION
1	HD6002	6	2N338
2	N754A	7	2N742
3	IN751A	8	2N333
4		9	2N2270
5		10	

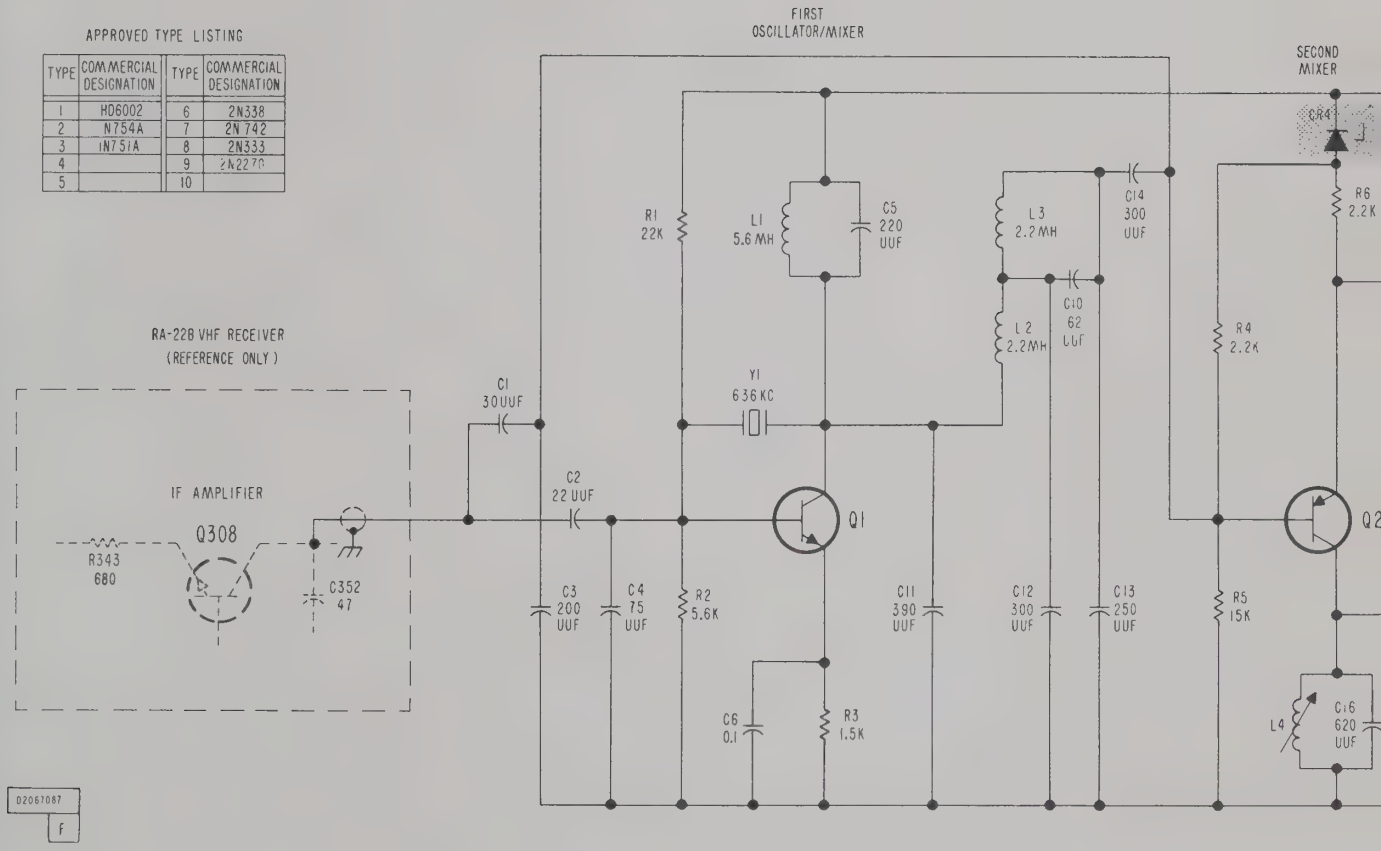


Figure 6-5b. 4RAX-21/22 Super Squelch Option, Schematic Diagram

SEMICONDUCTOR DEVICES

REFERENCE DESIGNATION	TYPE	REFERENCE DESIGNATION	TYPE
CR1	1	Q1	6
CR2	1	Q2	7
CR3	2	Q3	6
CR4	3	Q4	~~8~~ 9

APPROVED TYPE LISTING

TYPE	COMMERCIAL DESIGNATION	TYPE	COMMERCIAL DESIGNATION
1	HD6002	6	2N338
2	1N754A	7	2N1742
3	1N751A	8	2N333
4		9	2N2270
5		10	

NOTES:
1. ALL RESISTANCE IN OHMS. K=1000
   ALL CAPACITANCE IN UF UNLESS OTHERWISE STATED.
2. MODIFICATION SPECIFICATION 2072937-0001, (REFERENCE ONLY)

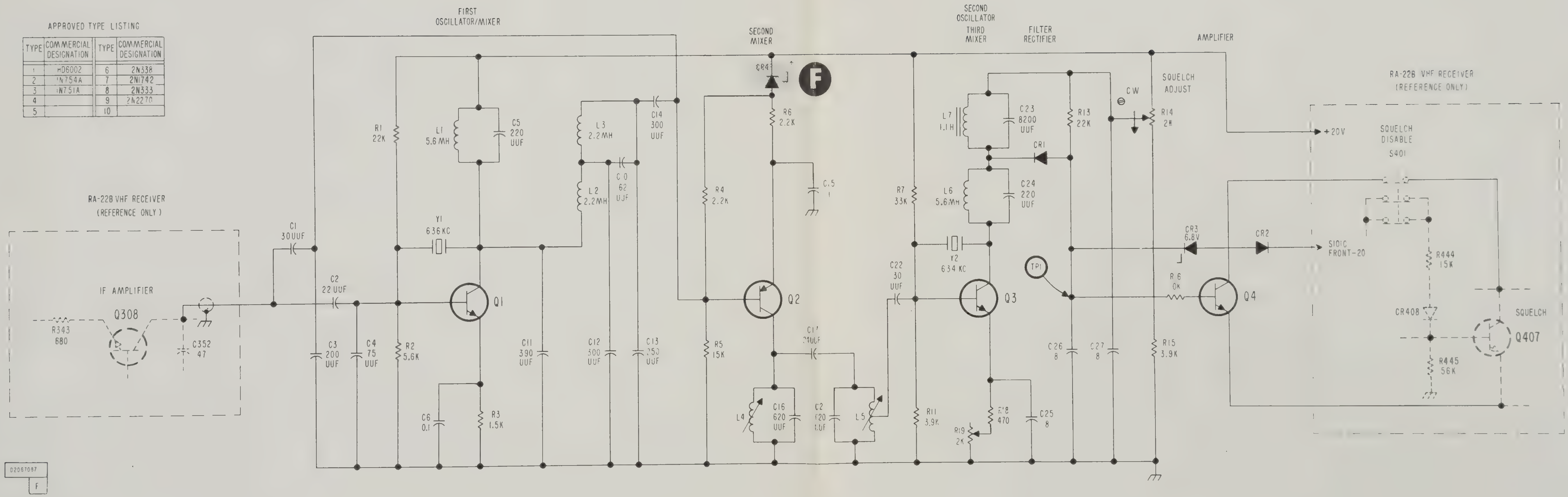
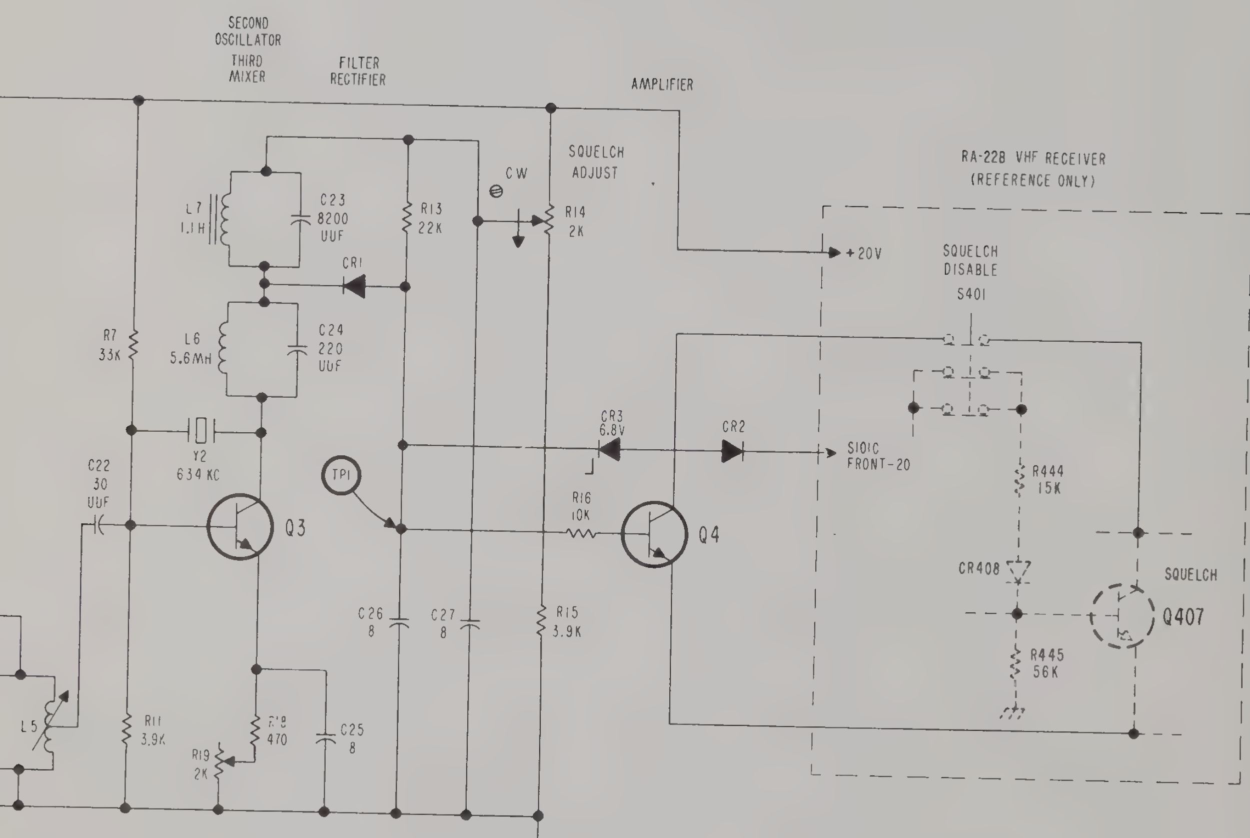


Figure 6-5b. 4RAX-21/22 Super Squelch Option, Schematic Diagram



SECOND OSCILLATOR
THIRD MIXER
FILTER RECTIFIER
AMPLIFIER
SQUELCH ADJUST
CW
R14 2K
R13 22K
L7 1.1H
C23 8200 UUF
CR1
L6 5.6MH
C24 220 UUF
R7 33K
Y2 634 KC
C22 30 UUF
Q3
TP1
R16 10K
Q4
CR3 6.8V
CR2
S101C FRONT-20
C26 8
C27 8
R15 3.9K
R11 3.9K
R18 470
R19 2K
C25 8
L5
RA-228 VHF RECEIVER (REFERENCE ONLY)
+20V
SQUELCH DISABLE
S401
R444 15K
CR408
R445 56K
SQUELCH
Q407